

WORLD GEOGRAPHY

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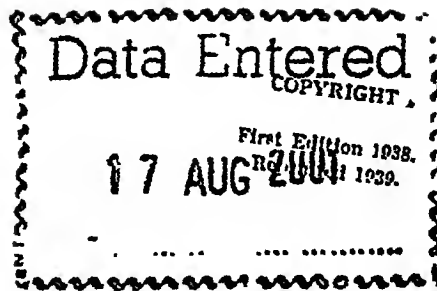
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MACMILLAN AND CO., LIMITED
ST. MARTIN'S STREET, LONDON

1939



✓ 3.5.52
25.2.42 ✓

PRINTED IN GREAT BRITAIN

PREFACE

TEXT-BOOKS of geography for use in Secondary Schools are of many types and vary greatly in scope ; so that teachers have a wide range of choice when selecting a class-book which more or less follows the order and style of treatment of the subject they themselves have found appropriate for their courses. Whether they prefer separate books for successive school years, or that regional, practical, human, economic or political aspects of geography should be in the foreground, suitable text-books are usually available. In all School Certificate examinations, knowledge is required of the outlines of World Geography, including the elements of physical geography, particularly with reference to the earth as the abode of man. The present volume deals with these aspects of the subject, among others.

When the range is geography of the world and not of a particular region, continent or country, all that can be attempted in a text-book intended for use in schools is to bring together the main facts within reasonable limits of space, leaving teachers to deal with this material in their own way. For this reason, the full implications of some parts of the subject are here merely outlined rather than fully developed, though it is hoped that the matter and treatment will suggest the lines which further study should follow. It is believed that the sequence of regional geography followed in this book will be found satisfactory for both general and examination purposes, but the arrangement of subjects is such that this sequence can be varied as may be desired by the teacher.

The possession of a good atlas by every pupil is now regarded as essential in the teaching of geography. The maps included in this book are, therefore, intended to help in certain details and for revision study rather than to take the place of an atlas. For similar reasons, picture illustrations have been omitted, as every well-

equipped teacher or school in these days has a sufficiently large supply of photographs and other pictures to illustrate scenes and places typical of different geographical interests. Neither maps nor pictures are of much educational value unless they are large enough to be made the subjects of actual lessons upon them.

Grateful acknowledgment is expressed to Mr. Austin A. Miller for permission to use his system of climatic classification, to Sir Isaac Pitman and Sons, Ltd. for their consent to the reproduction of the Geological Map of the British Isles from *Wonders of the Earth's Crust*, by H. E. Taylor and to the examining bodies which have given me permission to reprint questions from their examination papers. A list of these authorities is given on page xvi.

To complete a book of this type it is obviously necessary to consult many sources of reference, and I should like to admit my indebtedness to such books as *The British Isles* by L. Dudley Stamp and S. H. Beaver, *North America* by Ll. Rodwell Jones and P. W. Bryan, *South America* by E. W. Shanahan and *Europe* by M. R. Shackleton.

I wish especially to thank Sir Richard Gregory for his help and advice at all stages in the preparation and production of the book ; and also to express appreciation of a number of valuable suggestions made by Messrs. Macmillan's representatives in North America, Australia and India, to whom were submitted the page proofs of chapters dealing with their particular regions.

E. O. ROBINSON

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SCHOOL CERTIFICATE EXAMINATION QUESTIONS

The abbreviations used to denote the sources of examination questions are as follows :

C.S.C.	Cambridge School Certificate
C.W.B.S.C.	Central Welsh Board School Certificate
J.M.B.S.C.	Northern Universities Joint Board School Certificate
L.G.S.	London General Schools
L.M.	London Matriculation
O.S.C.	Oxford School Certificate
O. & C.S.C.	Oxford and Cambridge School Certificate
S.L.C.	Scottish Leaving Certificate

PART I

CHAPTER I

SHAPE AND STRUCTURE OF THE EARTH

GEOGRAPHY may be broadly defined as the study of the earth in relation to the life and needs of man. It has been said that "the proper study of mankind is man"; and in order to understand the place of man on the earth, it is necessary to know something of his environment or surroundings, and how he adapts himself to these conditions or controls them for his own purposes. A brief survey of the world itself is, therefore, desirable before proceeding to describe the activities of its inhabitants.

The earth is a spinning globe which is believed to have come originally from the sun in a gaseous condition and to have condensed in the course of ages to the present solid state. On every rotating globe there are two points which are at rest. In the case of the earth these points are the North and South Poles; the straight line joining them is the axis of rotation. Owing to centrifugal force set up by this rotation, the earth is not perfectly spherical in shape but has a slight bulge at the equator where the force of the rotation has the greatest effect.

The earth is sometimes said to have the shape of an "oblate spheroid", that is, flattened or depressed at the two poles, like an orange. As a matter of fact, the part of the earth near the North Pole is depressed, but near the South Pole is elevated; and it is usual now to say that the earth is a "geoid", instead of being any particular geometrical shape.

The solid portion of the earth may be regarded as consisting of two parts, namely:

- (1) *the lithosphere*, or the crust upon the outer surface of which man lives;

(2) *the barysphere*, which consists of the remainder of the earth below this shell.

The lithosphere is formed of materials having an average density about three times that of water which have solidified from the molten originals and most of which have since undergone further changes. The thickness of this shell of solid rock is from forty to fifty miles.

The barysphere consists of a substratum of basaltic nature extending to a depth of about 1000 miles below the lithosphere. Under this is the core of the earth consisting of metallic iron and nickel and having a density about eleven times that of water. The temperature is high enough to melt all such metals under normal conditions, but the pressure is so intense that the core of the earth remains solid.

Surrounding the solid portion of the earth are the liquid and gaseous envelopes formed by the mixing and cooling of the gases given off as the earth cooled. These are :

(1) *the hydrosphere*, which is the water envelope or the oceans. It is sufficient to cover the entire surface to a considerable depth, but owing to the uneven nature of the surface it covers only 72 per cent. of it, leaving man 28 per cent. upon which to live ;

(2) *the atmosphere*, composed mainly of oxygen and nitrogen which extends upwards for some 200 miles, but, as it becomes less dense according to distance from the surface, the chief portion of it lies within eleven miles of the surface.

Since man has no immediate contact with the barysphere, there is no need to consider it any further, but as he is obviously very much affected by the three other spheres it is necessary to consider these to some extent in order to get a true idea of his background.

The Rocks of the Earth's Crust

The lithosphere, or solidified crust of molten material, is not uniform throughout but consists of a variety of materials which are called " Rocks ". These may be divided into four main groups as follows :

I. Igneous rocks.—As their name suggests these have been made directly from the molten material. They were the first to be

formed, so that any of them which still exist must obviously be hard. They consist of two main types :

(a) *Crystalline rocks*. When the molten liquid cooled slowly it crystallized out into its separate constituents, forming a very hard rock. This slow cooling took place below the immediate surface, on which a crust of solid material had formed more quickly. Where it is on the surface now (*e.g.* granite), it shows that the overlying crust has been worn away.

(b) *Non-crystalline rocks* were formed when the cooling was too rapid to allow of crystals being formed (*e.g.* lava).

2. *Sedimentary rocks*.—After the igneous rocks had been formed, they were acted upon by the various forces which wear away or erode rock surfaces. The material which was worn away from the rocks was carried away elsewhere by running water. This material was deposited on the beds of seas and lakes. Frequent variations in level (*i.e.* frequent in a geological time sense) caused these materials to be deposited in layers. Gradually they became compressed and formed, in some cases, quite hard rocks, which from their origin are known as sedimentary rocks (*e.g.* sandstone). The layers in which they were put down still show, as the rocks are of varying nature. The layers are termed strata.

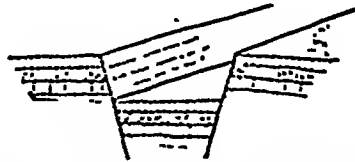
3. *Organic rocks*.—These, as their name suggests, have been formed from living organisms. When, for example, the shell fish in the ancient oceans died, their shells sank to the bottom and formed a thick layer of material which later on was compressed to form a rock (*e.g.* chalk). In the same way, coal has been formed from the remains of plant life.

4. *Metamorphic rocks*.—Throughout its history the world has been slowly cooling. This has caused it to contract and has thus forced its outer skin to shrink to meet its reduced size. This shrinking has brought great pressure to bear on the rocks of the crust, and this pressure has generated heat. Pressure or heat, or both combined, have been so intense that in many cases the rocks have been changed from their original form into something very different in appearance (*e.g.* quartz). The word metamorphic means changed.

Land Forms

As the earth's crust has been subjected to tremendous pressure, which was sufficient to change the very nature of the rock, it is easily understood that this pressure also brought about tremendous changes in the shape or form of the crust. Great movements took place which were sufficient to cause the beds of seas to rise and become dry land, while old land masses disappeared beneath the waves. At the same time, local variations in shape and appearance occurred. The main types of "land form" produced by these pressure changes are as follows :

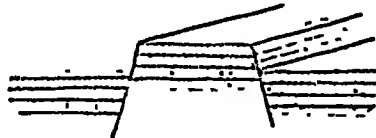
1. **Faulted regions.**—When the old hard rocks were subjected to pressure they resisted it, but eventually had to give before it. When they did give, it was usually by cracking. These cracks are



Rift Valley—Land dropped between two faults.



Ridges formed by land sinking after faulting.



Block mountain left unstanding—land on either side having dropped after faulting.

FIG. 1. LAND FORMS DUE TO RIFTING.

known as *rifts* or faults. Once a crack had occurred the pressure was relieved. Sometimes land sank: sometimes it rose. The diagrams (Fig. 1) illustrate the shapes which were formed as the

result of rifting. These were naturally much altered by being eroded. It should be noted that, though often tilted, the strata remain comparatively straight.

2. **Folded regions.**—When pressure was applied to the less resistant rocks, and more particularly when that pressure was lateral, they tended to buckle up before the strain and form "folds". In a simple fold system there would be a series of upfolds and downfolds which would, of course, be roughly parallel to one another. The upfolds were the earliest "fold" mountains and the downfolds valleys. To geographers the upfolds of strata are known as *anticlines* and the downfolds as *synclines*. In many cases the folding was very complicated and quite hard rocks were often distorted to a very great extent. The present mountains are not merely these upfolds and downfolds, however, and the changes that have led to the present shapes will shortly be touched upon.

3. **The unfolded lowlands.**—In many cases layers of the sedimentary rocks formed by deposition on beds of seas, rivers and lakes, have gradually been brought above the surface of the water; either by continuous deposition or by some gentle earth movement, and form big plains with the rock layers stretching undisturbed over large areas. In the lowest areas of these plains the material has been formed quite recently by the rivers which flow over the plains and is known as *alluvium*. There are several large alluvial plains in the world, all of them built up by rivers flowing from high ground into the sea.

Forces that have sculptured the Earth's Surface

As soon as any area appears above the surface of the sea, the "forces of erosion", or as they are sometimes called, the "agents of denudation", set to work to wear them down once more. These agents are:

(a) *Rain and running water.*—Rain breaks up rocks slowly or quickly according to whether they are hard or soft, soluble or insoluble, and then running water carries away the material, partly in solution and partly by the power which its movement gives it to carry material in suspension. This material in suspension, by

being rubbed against the sides and beds of streams, also has considerable erosive power.

(b) *Ice*.—If a drop of water gets into a crevice and then freezes it expands, and in so doing tends to break up the rock, so that it can eventually be carried away. Further, ice in large quantities has at one time or another moved over large parts of the earth's surface and has in many places literally scraped away parts of the surface.

(c) *Rapid changes of temperature* break up the rocks and enable particles to be carried away.

(d) *Wind* is powerful enough to move particles of rock, and these particles, while in motion, are also able to erode the surface of the earth.

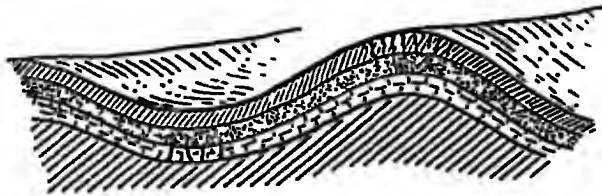
The general name given to the wearing away processes is *weathering*.

The sculptor's tools at work.—Having noted how the land forms were begun and learned something of the tools that nature uses to shape them, it is now possible to consider some of the shapes that result.

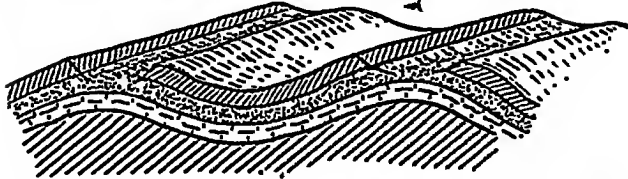
When a piece of sugar is dissolved, it is always the edges which give way first. In the same way, the "edges" of the rock formations were the first to be worn away. Thus the upstanding edges of the rifts were rounded off to a certain extent. Naturally at the edge of the rift there was not always a clean break, and the little cracks were soon eaten into, so that notches were cut back into the lands left standing up, and thus many have been much reduced in size. Even if the top layer was quite hard, a soft layer might be exposed and this could be worn away and so undermine the harder layer.

Consider now what happened to the folded formations. At the tops of the anticlines there would be great strain on the layers, and they would tend to split (really a form of faulting). At the same time, the material in the synclines would tend to be compressed and therefore hardened. Thus not only were the tops of the original upfolds more exposed, they were also less able to withstand weathering. Gradually the upfold would be worn away, especially at the places where the softer layers became exposed. In many places the bottom of the synclines, because of their compression, have been able to resist weathering so that they now remain higher than the areas

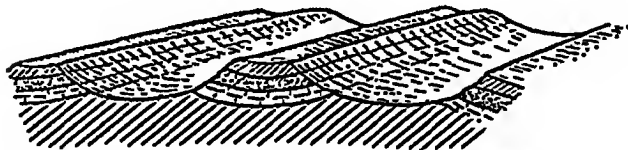
which were once occupied by the anticlines. In such areas, where the hard rocks appear at the surface, they form ridges. The ridges and valleys still follow the original parallel lines that were first formed. Valleys running along the length of the formations like this



Simple Folding - showing anticline and syncline - with point of weakness at top of anticline.



Erosion at work - eating into anticline along line of weakness.



After countless ages of erosion - anticlines worn away. Harder rocks of syncline now form ridges.

FIG. 2. SIMPLE FOLD FORMATIONS AND THEIR EROSION.
Very often the *rifts* at the crests of the anticline cause the tops of the fold to collapse.

are known as *longitudinal valleys*, while valleys which have cut their way at right angles to them, that is, where streams have run down the slopes, are known as *transverse valleys* (Fig. 2).

Volcanic Activity

The regions of comparatively recent earth movement have not yet reached stability. As a result they are subject to particular forms of activity. It has been noted that at the top of an anticline there is a line of weakness formed. This line of weakness sometimes gives under pressure and molten material forces its way to the surface. Thus many parts of the earth have rocks made from the rapid

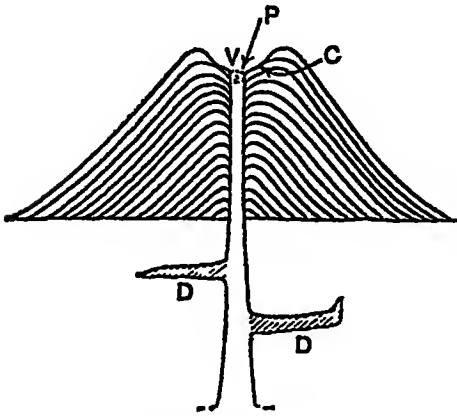


FIG. 3. A VOLCANIC CONE BUILT UP OF LAYERS OF LAVA, ASHES, ETC.

V = Vent. P = Plug (in a dormant volcano). C = Crater. DD = "Dykes" of solidified lava.

cooling of molten material that came welling up through cracks in the surface and then spread over the surface. When, however, only a small opening is made, the molten lava and other material in the form of fragments of rock and incandescent dust gradually build up a cone-shaped structure surrounding this opening. Such a formation is known as a *volcano*. Fig. 3 shows a section of a typical volcano and the way in which it has been built up. When lava is not actually being emitted

from the vent it may become blocked by a "plug" of rocks and cooled lava, and then the volcano is *dormant*.

Any subsequent activity must be preceded by the blowing away of the plug, and it is such eruptions as these that have caused the great volcanic disasters of history, such as the overwhelming of Pompeii and the Krakatoa explosion. Eventually the area becomes stabilized and the volcano becomes *extinct*, the crater often being occupied by a crater lake. The chief active volcanoes are, of course, associated with recent mountains, such as the volcanoes in Italy, and the "ring of fire" that practically surrounds the Pacific Ocean.

Earthquakes.—If any settlement of the earth's crust takes place suddenly it must create a considerable disturbance for some way

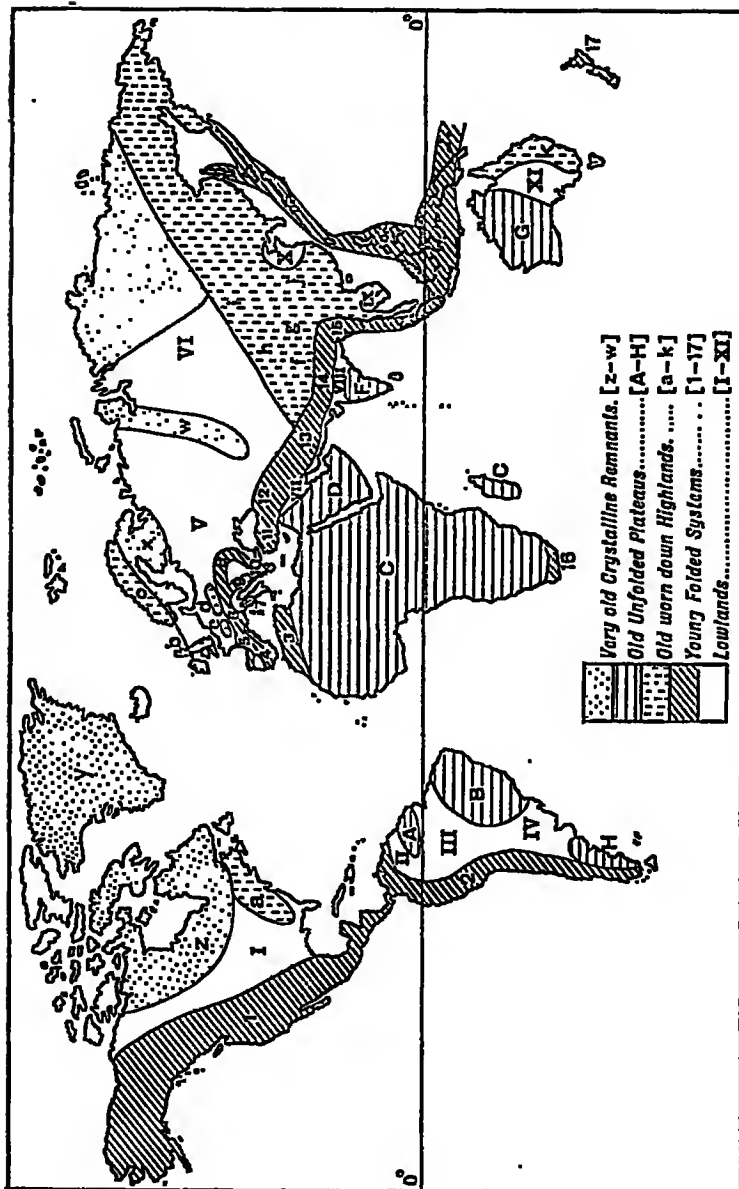


FIG. 4. MAIN STRUCTURAL AREAS OF THE WORLD.

The letters and numbers mark physical or structural regions. These should be identified (with the aid of an atlas) and remembered.

round. Such a movement is an earthquake, and it sends out wave motions through the earth's crust, which decrease in intensity according to distance from the "seismic" centre. These waves only travel through the solid lithosphere, and by recording their intensity and direction on seismographs, it has been possible to learn a good deal concerning the lithosphere.

The main centre of earthquake activity is round the Pacific, where high mountains close to deep seas give rise to rather unstable conditions. Lines of faulting are also liable to earthquakes.

The General Structure of the Land Masses

From the description of the way in which various types of land forms arise, it is possible to draw one or two general conclusions. First of all, the regions of most recent folding will probably be the highest regions, since they have had less time in which to be eroded, while the older areas will be worn down considerably.

Secondly, the large areas of most recently formed lowland will be found near the areas of recent folding, because they will be undergoing considerable erosion and so will be providing considerable material for deposition. Areas of recent formation are alluvial plains. If an atlas map of the world showing physical features is compared with the map (Fig. 4) showing the main structural areas of the world, it will be noticed that the chief structure lines of Eurasia run from east to west while those of the Americas run from north to south. The various areas are numbered. Find the names of the structural features to which the numbers refer and learn them.

EXERCISES ON CHAPTER I

1. What earth-forming movements are (a) very slow, (b) sudden? Give examples of each type.
2. Describe four methods by which the surface of the earth may be worn away. (C.S.C.)
3. Explain how an alluvial plain is formed. Locate important examples and suggest reasons why such plains are important.
4. Make lists of the physical regions numbered in Fig. 4, and arrange the groups in order of age of formation.
5. Distinguish carefully between the various types of rock.

CHAPTER II

EARTH MOVEMENTS IN SPACE

BEFORE going on to consider the atmosphere and its influences on mankind, it is necessary to know something of the regular movements of the earth with regard to the sun and the effect these movements have upon conditions on the earth. There are three main facts to bear in mind, viz. :

1. The earth rotates on its own axis once in twenty-four hours.
2. It revolves round the sun—following an elliptical path or orbit—once in $365\frac{1}{4}$ days.
3. The earth's axis does not make a right angle with the plane of the orbit, but is inclined to it at an angle of $66\frac{1}{2}^{\circ}$. The plane of the earth's equator is therefore inclined at a constant angle of $23\frac{1}{2}^{\circ}$ to the plane of the orbit.

Day and Night

The rotation of the earth upon its own axis is the direct cause of day and night, for each part of the earth, except near the poles, is thus caused to spend part of the day in the sun's rays—the source of light—and part of the day facing away from the sun, so that it cannot receive light directly.

The tilt of the axis, taken in conjunction with this fact, has the very important effect of causing day and night to be of varying length at different parts of the earth's surface.

If the earth's axis were upright, as compared with its path, all places would have equal day and night—both being of twelve hours' duration. As will be seen from the diagram (Fig. 5), which represents the position of the earth in relation to the sun in the northern summer, the tilt of the axis causes an unequal distribution of light so far as the two hemispheres are concerned. It will be seen from it

that the place *A*—whose daily course is marked—spends more of its time in the part illuminated than it does in the part which is dark. In other words, it has a longer day than night. Conversely, place *B* has a longer night than day. At the same time it shows that

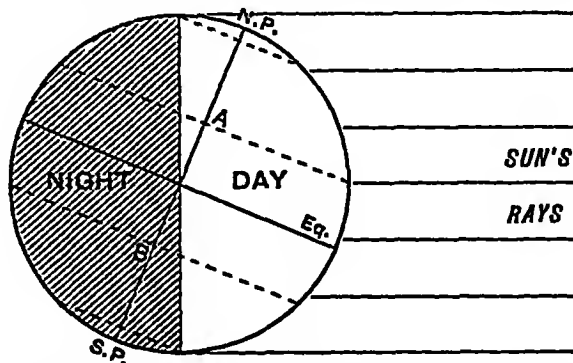


FIG. 5. THE VARIATION OF DAY AND NIGHT.

Note that, owing to the great distance of the sun from the earth, and also to its great size, its rays are taken as being parallel.

the equator has an equal distribution of day and night, and it will be found that this will always be the case. An area round the North Pole is continuously in the light while an area round the South Pole, at the same time of year, has continuous darkness.

Fortunately for the world as a whole the revolution of the earth round the sun causes the tilt of the axis *relative to the sun's rays* to vary, so that sometimes the Northern Hemisphere has a maximum illumination, sometimes the Southern Hemisphere and sometimes both have an equal amount. This causes the length of day and night to vary from day to day during the year for all parts of the world except the equator, which has equal day and night all the time.

Further, it causes the place which has the direct rays of the sun, *i.e.* the place which has the sun directly overhead, to change from day to day. Although it is really the movement of the earth which causes these changes, to people living upon the earth it is the sun which appears to change its position with regard to the earth. So the sun is spoken of as "rising in the east and setting in the west" although it is really the rotation of the earth which swings each place round from west to east, first into the rays of the sun and then out of

them again. The varying directness of the sun's rays with regard to the different parts of the earth are thus due to the *apparent movement of the sun*, and not to a real movement of that body.

When the sun is overhead at the equator all parts of the world have equal day and night; and the dates when this occurs (approximately 21st March and 23rd September) are called *equinoxes*. The limits of the sun's apparent movement are $23\frac{1}{2}^{\circ}$ North and South of the equator, and these points are called *tropics* (meaning turning points). As the sun then appears to stop its movement and go back again, the dates are called *solstices* (*i.e.* sun stops). The solstice when the sun reaches the Northern Tropic of Cancer is 21st June, and when it reaches the Southern Tropic of Capricorn is 22nd December. Notice the relationship of these tropics with the angle between the plane of the equator and the plane of the orbit. The orbit of the earth is slightly elliptical, and the sun is not quite the centre of it. The result is that the sun is over the southern hemisphere seven days less than it is over the northern hemisphere.

In the diagram of day and night attention was directed to the polar areas of continuous day and night. A moment's thought will show that in theory the poles themselves each have a six month day and a six month night, though, owing to refraction and other causes, this is not actually the case. The limits of the areas which can receive continuous day or night are $66\frac{1}{2}^{\circ}$ N. and S. and these are the limits of the Arctic and Antarctic circles.

The Seasons

Before considering another important effect of the revolution of the earth around the sun, it is necessary to understand the manner in which the heat from the sun's rays—the source of heat as well as light—is distributed. This is most simply understood from the diagram (Fig. 6). It will be seen that the warmth of any place depends upon the directions of the sun's rays.

As the sun may be regarded as fixed, and the earth revolves around it with its axis inclined at a constant angle to the orbit, the sun's rays strike the earth at different angles during the year, and the durations of day and night also differ north and south of the equator.

This is seen in Fig. 5 in which the northern hemisphere is shown tilted towards the sun. Places in that hemisphere not only receive the sun's rays for a longer period ; they also receive them with greater intensity than do places in the southern hemisphere. For

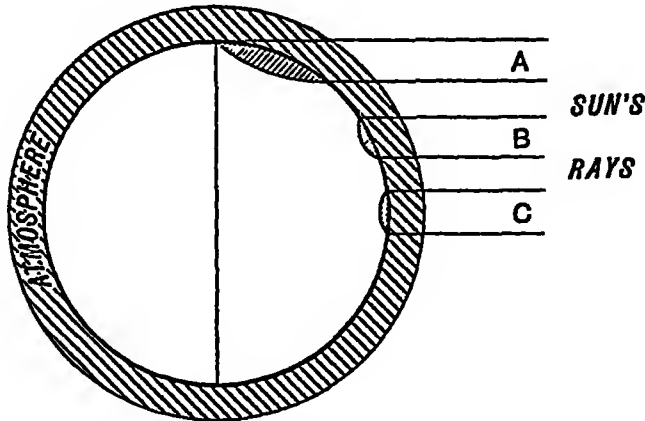


FIG. 6. THE UNEQUAL HEATING OF THE EARTH'S SURFACE.

The bundles of rays A, B, and C are all of the same size and so have the same heat. The shading shows the area of surface that each has to heat. It will be seen that A has to heat a greater area than C, so that the amount of heat for each unit of area will be less. Further, owing to the curve of the earth, A has to pass further through the atmosphere, and, as this absorbs some of the heat, A has actually less heat than C with which to warm a much greater area.

both reasons they will therefore receive more heat. As the earth continues on its orbit, a point will be reached where the conditions are reversed, while at an intermediate point places similarly placed in each hemisphere will be receiving the same amount of heat.

This aspect of the matter explains the seasons, for when the northern hemisphere is tilted towards the sun it is receiving its maximum amount of heat and is experiencing summer, while when it is tilted away from the sun it is receiving its minimum amount of heat and is experiencing winter. At the intermediate positions it is experiencing the intermediate seasons of spring and autumn. It will at once be noticed that the two hemispheres must thus have their seasons reversed as compared with one another.

Latitude and Longitude

The fixing of position upon the surface of the sphere is one of the problems that faces geographers. This is overcome by making use of the only satisfactory type of measurement that can be applied to a spherical body—measurement of the angle subtended by an arc at the centre of the sphere.

There are two fixed points upon the earth, the North and South Poles—which are the ends of the axis on which the earth rotates.

A plane with the same diameter as the earth placed between these two points makes a line upon the surface of the earth which is known as a *great circle*; any number of these circles can be drawn passing through the two poles. On the other hand, only one diameter plane can be made to cut the axis at right angles. This makes a great circle equidistant between the two poles.

This great circle is the *equator* and forms the fixed point from which distances north and south can be measured. On the other hand, any half of a great circle cutting the poles could be used as a starting point for measurements east and west, so it is necessary to fix upon one. As measurements of the earth's surface were first made in the Mediterranean district, the distance east and west is known as *longitude* as the length of that sea runs from east to west, while distance north and south is known as *latitude*.

Latitude.—In Fig. 7, *E, E* represents the equator. The latitude of the place *A* is expressed by the angle α . It will be seen that any point along the small circle *A, A'* will make the same angle with the plane of the equatorial great circle. Thus the small circle *A, A'* is a line of latitude, and, as this line is parallel to the equator, lines of latitude are known as *parallels*. The poles have a latitude of 90° N. and S. respectively.

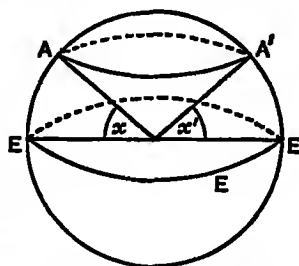


FIG. 7. LATITUDE.

Longitude.—To understand the measurement of longitude it is simplest to imagine a sphere with a segment cut out of it. (Fig. 8.)

Then the distance between the two points A, A' (on the equator) or the two points B, B' (on a line of latitude) can be expressed in terms

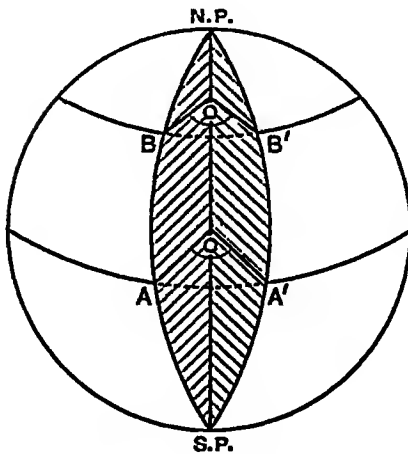


FIG. 8. LONGITUDE.

of the angle between the two planes forming the segment—that is, the angle O . This angle is the longitude difference between the two places.

All lines running from pole to pole are halves of great circles, and there is nothing to make one an obvious starting point for the measurement of longitude in the same way that the equator makes a starting point for latitude.

In most maps the starting point is the longitude line through Greenwich. Since all places along any line of longitude have mid-day at

the same time, the lines of longitude are known as *meridians*. The line through Greenwich is known as the *prime meridian*.

Determination of latitude.—To determine latitude use is made of the fact that light rays of the sun can be regarded as parallel.

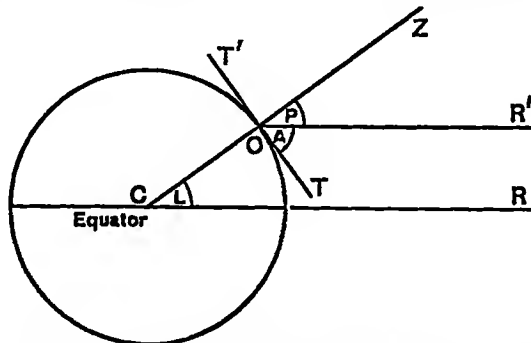


FIG. 9. DETERMINATION OF LATITUDE WITH SUN OVERHEAD AT THE EQUATOR.

In Fig. 9 the sun is overhead at the equator. R, R' are rays of the sun. C is the centre of the earth. O is the position of the observer. Z is the line of zenith, *i.e.* the line through the observer

to the centre of the earth and so pointing vertically above his head. T, T' —the tangent—is the horizon sight line. The latitude of the place O is the angle L at the centre of the earth. Since R, R' are parallel $L = P$ (corresponding angle). If, by means of a sextant, the angle of altitude of the sun (*i.e.* its height above the horizon) is measured, it is possible to find the latitude of O , for

$$L = P = 90^\circ - A \text{ (altitude of sun's rays).}$$

The sun, however, is not always overhead at the equator.

Take the case (Fig. 10) when it is overhead on the same side of the equator as the observer. The sun is overhead at x° north. A study of the diagram will show that, since $P = L - x$, latitude can be found by

$$L = P + x = (90 - A) + x.$$

When, as in Fig. 11, the sun is overhead on the opposite side of the equator from the observer, latitude is found by

$$L = P - x = (90 - A) - x.$$

The position of the overhead sun can be obtained from a nautical almanac.

Determination of longitude.—Longitude is determined very simply by making use of the time taken by the earth's rotation. Since it takes the earth 24 hours to rotate on its axis, *i.e.* through 360 degrees, it takes it 1 hour

to turn through 15° and 4 minutes through 1° . In Fig. 12, which

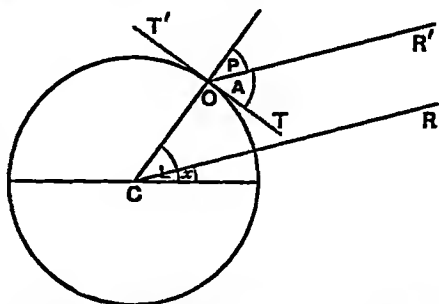


FIG. 10. DETERMINATION OF LATITUDE WHEN SUN IS OVERHEAD ON SAME SIDE OF EQUATOR AS OBSERVER.

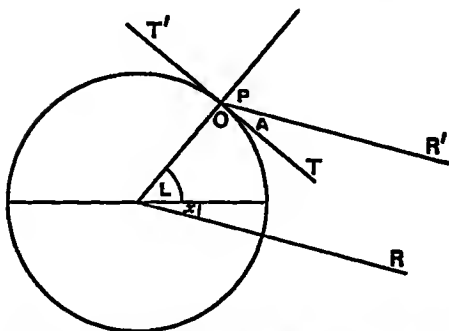


FIG. 11. DETERMINATION OF LATITUDE WITH SUN OVERHEAD ON OPPOSITE SIDE OF EQUATOR FROM OBSERVER.

represents the earth as looking down upon it from above the North Pole, certain lines of longitude are marked, while $R \dots R$ represent the rays of the sun. The prime meridian (0°) is receiving the most direct rays, and thus it is at noon. The place A to the east has already passed under the direct rays, and so, having had noon, is in its afternoon. Place A' to the west has not had noon, and so is in its morning.

In the determination of latitude it is necessary to take observations

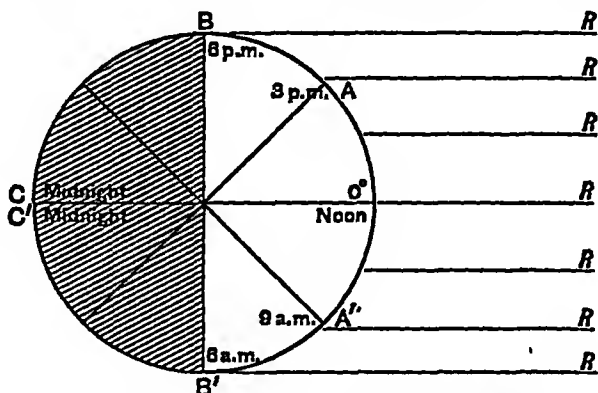


FIG. 12. LONGITUDE AND TIME.

to find the altitude of the mid-day sun. When the sun is at its zenith for any place, it is noon at that place.

Thus if the sun time of the prime meridian is known it is possible to determine the longitude of the place. Greenwich time can be found by carrying an accurate chronometer set at Greenwich time, or, nowadays, by wireless.

Thus, if it is noon at place A , when Greenwich time is only 9 a.m. place A is three hours in front of Greenwich, *i.e.* has its sun three hours earlier. Three hours, in terms of the earth's rotation, represents 45° , so A is 45° E. Similarly if A' has noon when Greenwich time is 3 p.m. A' is three hours behind Greenwich—and so is 45° W.

Time Zones and the Date Line

A further study of Fig. 12 will show that complications with regard to time arise. In the olden days, when travel was slow and communication difficult, each area took its time from its own noonday. Now, however, organization of transport and similar matters makes it essential for large areas to co-ordinate their times. England is small enough for all parts to take their time from the Greenwich meridian. Other parts of the world cannot do this. In the U.S.A. and Russia, for example, where distances are vast and there is a big difference in noon between one part of the country and another, there are "time zones" each 15° (or 1 hour) wide, each varying one hour in time from its neighbours. Thus, in crossing the

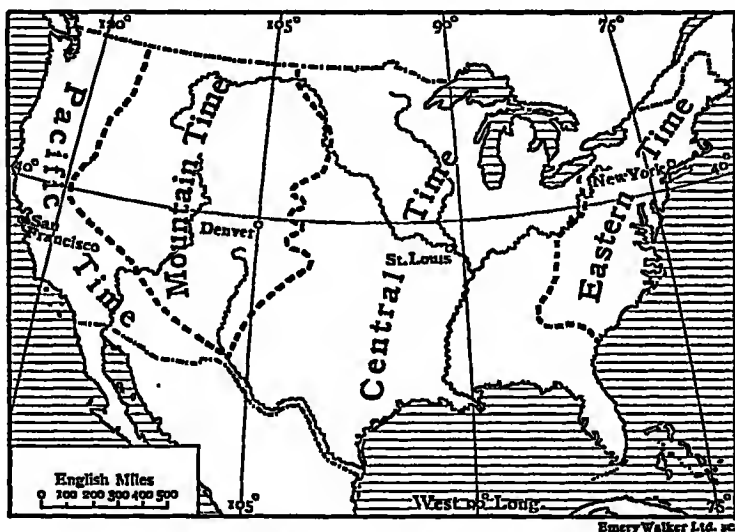


Fig. 13. MAP OF U.S.A. TIME ZONES.

In the U.S.A. it is necessary to alter one's watch four times, putting it back as one goes westwards and forward as one goes eastward. (Fig 13.)

Now consider what happens if the various time zones of the world are considered.

In Fig. 12 it is 12 noon on, say, March 21st. At A (45° E.) it is

3 p.m. on March 21st ; at B (90° E.) it is 6 p.m. and so at C (180° E.) it is midnight—at the end of March 21st. But, going westwards, at A' (45° W.) it is 9 a.m. ; at B' (90° W.) it is 6 a.m. and at C' (180° W.) it is midnight—at the beginning of March 21st. But C and C' are the same place for 180° E. and 180° W. coincide. Thus just to one side of the line people have finished March 21st ; on the other side they are only about to begin it.

Fortunately this 180° line runs almost entirely through the Pacific Ocean, and so adjustments are easy. Going eastward, it is necessary when crossing this *date line* to add a day. For instance, in the example given ; after finishing with March 21st it is necessary to have March 21st again. On going westward, however, it is necessary to miss a day, and, after finishing with March 20th, to go straight to March 22nd. This date line can be called the “line where the day begins,” and it is advisable for anyone who is anxious to get the best value out of a world cruise to arrange to sail eastwards!

EXERCISES ON CHAPTER II

1. Why have lands in the temperate zones four seasons in the year? Illustrate your answer by a diagram. (C.S.C.)

2. Explain carefully why it is warmer in England in July than it is in January.

3. Explain why lighting-up time is earlier in London than in Aberdeen in June, but later in December.

4. If it is noon at Greenwich on June 21st, state (a) the season of year, (b) the time of day, at the following places : Bombay, Sydney, Cape Town, New York, Valparaiso.

5. In the following examples, (i) is the altitude of the noonday sun, (ii) is position of the overhead sun, (iii) is position of overhead mid-day sun in relation to the observer. In each case find the latitude of the observer.

		(i)	(ii)	(iii)
A	-	40°	10° N.	South
B	-	30°	15° S.	South
C	-	80°	20° N.	North

CHAPTER III

THE HYDROSPHERE

ALTHOUGH a detailed study of the oceans is not necessary at this stage, it is essential to know something about them, for they have direct and indirect influences on mankind.

The water of the oceans is not fresh, but contains mineral salts, chiefly common salt, in the proportion of thirty-five parts to a thousand. It should be noted that the salinity of the oceans is not constant, but varies according to local conditions. Regions of high rainfall have comparatively low salinity and vice versa. Thus, round the equator there are regions of comparatively low salinity, while near the tropics the clear skies of the high pressure regions give rise to high evaporation and consequent increased salinity. Further polewards evaporation and salinity decrease. In the same way, partially enclosed seas into which few rivers flow are salt (*e.g.* the Red Sea) while those in temperate latitudes, which receive more rivers, have low salinity (*e.g.* the Baltic).

Apart from their influences on climate, it is the movements of the ocean that interest man most.

Currents

The surface waters of the oceans are blown by the regular winds in the same general direction as the winds themselves. Thus, in trade wind belts, on either side of the equator, there is a movement of surface waters from east to west, and in westerly wind belts a movement from west to east.

Currents directly caused by the winds are known as *drift currents*. It will be seen that these movements tend to pile water up on the east side of land masses in low latitudes, and on the west sides in higher latitudes. These waters, finding their own level, flow away

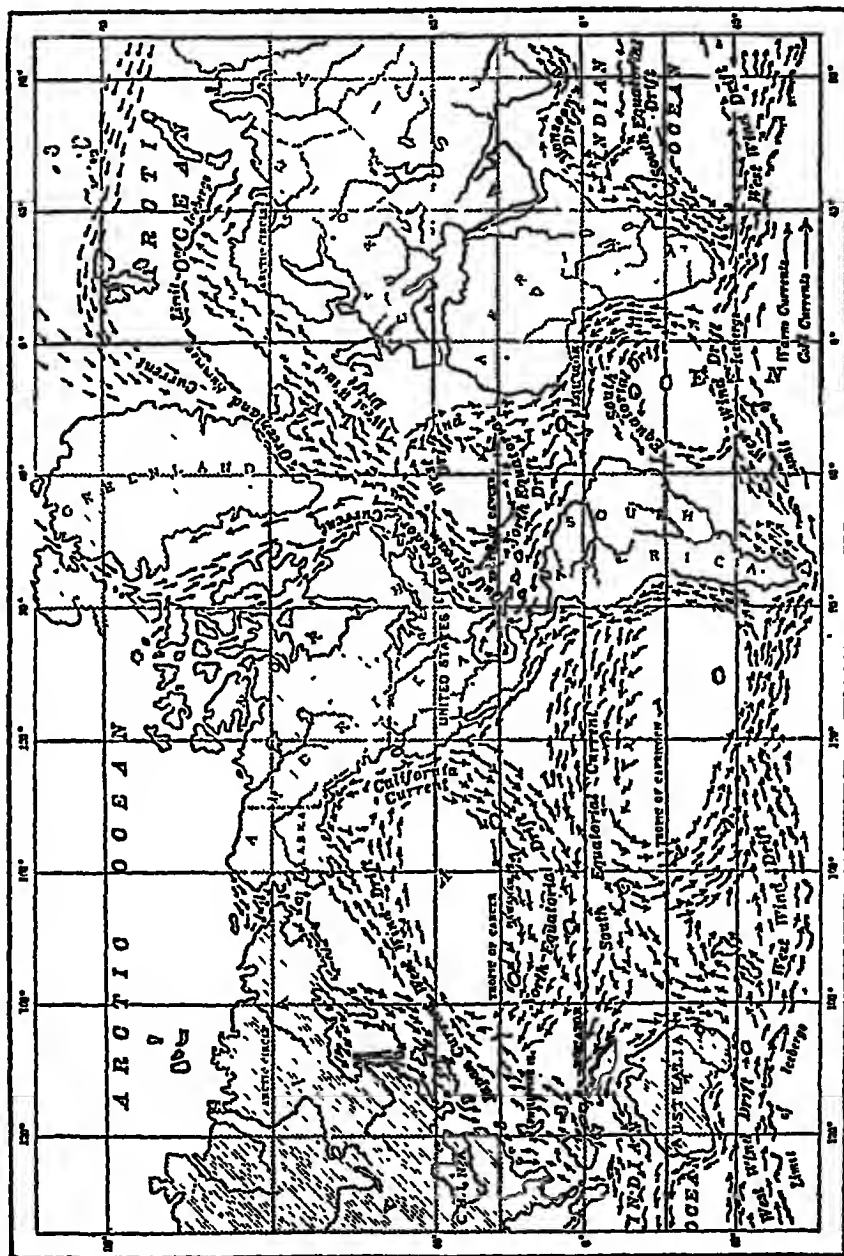


FIG. 14. THE MAIN OCEAN CURRENTS.

from such points, forming currents known as *stream currents*. Where waters are blown away from the western and eastern sides of land-masses, they are replaced partly by water coming in in stream currents, and partly by the upwelling of water from the ocean depths. This upwelling water is cold and has important influences on local climates. Ocean currents that flow away from the equator are warm: those flowing to it are cool. The air above them is correspondingly warm or cool, and it is this air, rather than the currents themselves, that influence climate. Fig. 14 shows the currents of the world, and a comparison of this with the map showing the main wind systems shows the relationship between the two. The main currents should be memorized.

Tides

All dwellers by, and visitors to, the seaside are aware of the daily changes in the level of the water that take place. These "tides", as they are called, occur at regular intervals of somewhat over twelve hours apart: from early times their association with the moon was realized, as particularly high tides were associated with certain phases of the moon.

The moon is a satellite of the earth, and the two bodies have a mutual gravitational attraction. At one time the tides were thought to be entirely due to this, for the pull of the moon's gravity was sufficient to cause the waters of the hydrosphere to be heaped up on the side facing the moon. In addition to this "heaping up" of water on the side of the earth facing the moon, there is one on the opposite side, and it is rather difficult to understand this as due simply to the moon's attraction.

If it is realized that, instead of the moon revolving round the earth, *i.e.* round the centre of the earth, it is really a case of both bodies revolving round a common centre of gravity, which, owing to the much greater volume of the earth, is situated at a point below the earth's crust, this second heaping up of waters can be understood. In Fig. 15 this common centre is marked C. It can be seen that, as the two bodies revolve, particles on the side of the earth opposite from the moon will tend to be thrown away from the earth by centrifugal

force and consequently the water envelope will tend to be heaped up on that side.

These facts then give rise to two bulges in the hydrosphere at opposite sides of the earth and in the line through the centres of the

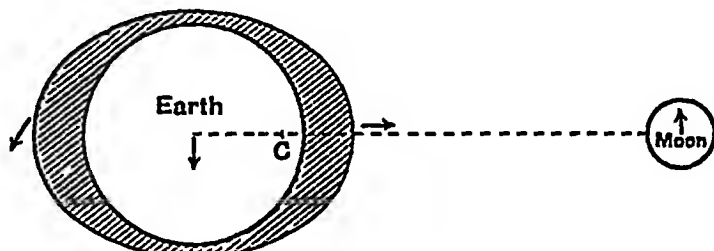


FIG. 15. THE CAUSE OF TIDES.

The earth and the moon revolving round a common centre of gravity (C).

earth and the moon. With the earth revolving on its axis every twenty-four hours it can be seen (Fig. 16) that place *A* should pass under each bulge and should therefore experience high tide at 12 hour intervals. While, however, *A* has been rotating the moon has progressed on its orbit (its total revolution occupies $29\frac{1}{2}$ days).

Thus, *A* has to go a bit further round to *A*² to get back to its

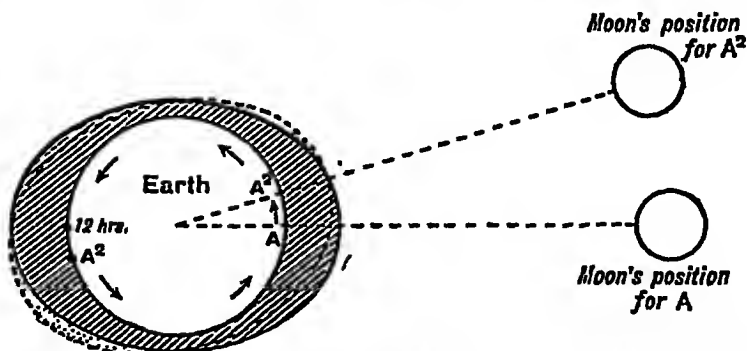


FIG. 16. DIURNAL LAG OF THE TIDES DUE TO THE MOVEMENT OF THE MOON IN ITS ORBIT.

relative position in relation to the tides, as is shown on the diagram. If the proportion is worked out it will be found that *A* has to rotate through another 14° , which will take 56 minutes. This explains why each high tide comes about 13 hours after its predecessor.

With the earth rotating from west to east the tidal wave should go round the world from east to west. It does do so in the great ocean expanses of the southern hemisphere. The tide experienced in the British Isles is a branch from this main tidal wave which is turned up the Atlantic Ocean. This is gradually deflected so that it sweeps up the Atlantic seaboard of North America, and approaches Europe from the west. When it comes to the British Isles it divides, one main branch going round the north of Scotland, and one along the English Channel.

It should be borne in mind that the tidal wave in the open ocean only has a height of about three feet, but that in the shallow waters of the continental shelf and in the various estuaries and channels this is considerably increased, so that rises of fifteen feet are common, and the Bay of Fundy (Nova Scotia) has a tidal rise of fifty feet.

There is one other point to consider. Although the moon is the main factor in causing tides, the sun also has a gravitational influence. Thus, when the sun and moon are approximately in a line, *i.e.* at full and new moons, the two work together and produce the extra high tides known as *spring tides*. At the half moons (first and third quarters) the two gravitational influences are in opposition and so the height of the lunar tides is diminished, giving the less marked high tides known as *neap tides*.

Rivers

Running water has already been mentioned as an erosive force. Any rain falling on the earth either soaks into the earth and, forming a saturated layer, eventually appears elsewhere as a *spring*, runs off in a direction determined by the slope, or is evaporated.

Both the first two give rise to streams, for a stream either has its source at a regular spring, which is found at a junction of porous and non-porous rock, or is the result of the drainage from some *catchment area* (the name given to a surface area that collects water into a drainage system).

Streams or rivers which rise in upland areas have three main divisions in their courses. In the hill areas is the *upper, torrent* or

mountain course. Here the stream is fast running, and its valley comparatively narrow. Lower down is the *middle* or *valley* course, where the stream is slower and the valley broad with fertile meadows. Finally comes the *lower* or *plain* course, with the river flowing slowly across open country, often in great bends or *meanders*. The whole area drained by a river and the *tributaries* which feed it is known as a *river basin*.

In the passage from source to sea several points can be noted. First of all, all running water tends to form a curved profile. This is because the power of water erosion is based largely upon the particles carried along, which wear away the rocks over which the water runs. The erosive power of a river depends on speed and volume. Near the source volume is low, and near the mouth speed is low, so that the region of greatest erosion is in the middle course. Consequently the section of a river valley, which consists of two water worn slopes, is shaped like a V with concave slopes.

In the lower course, as the river loses speed, it tends to build up its beds. It is thus always liable to overflow and the lower course

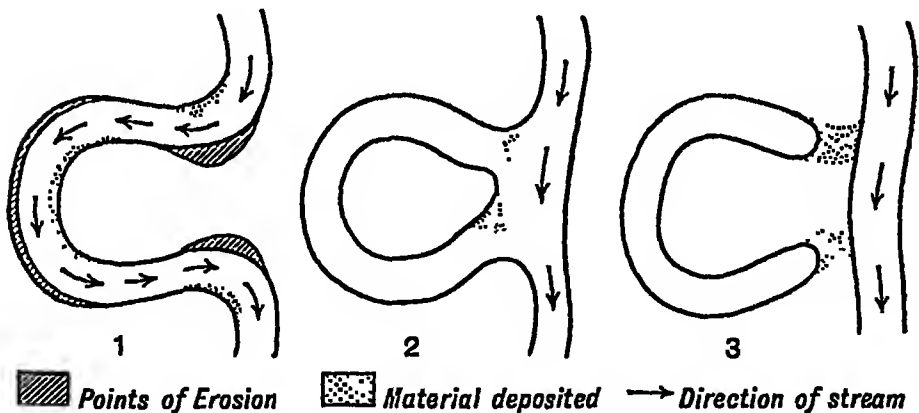


FIG. 17. STAGES IN THE FORMATION OF AN OX-BOW LAKE.

of a river frequently consist of a *flood plain*, across which the river winds between high banks, partly natural and partly artificial. Rivers of this type are not very valuable for navigation, as the great bends are detrimental and there are many shifting sand banks.

When a river of this type enters the sea its current is too slow to carry the silt far out to sea, and, if there is no tide or current to carry it away, the silt gradually builds up a series of islands at the mouth and these break up the stream into a series of small channels. Such a formation is known as a *delta*, and the channels are known as *distributaries* (for example, the Nile and the Mississippi rivers).

If the sea into which the river flows is tidal, the tide keeps the mouth of the river clear, and such rivers have a broad mouth known as an *estuary*.

While the river winds across the flood plain it frequently shortens its course by cutting out one of the great bends. That portion of the river which is cut off forms a lake known as an *ox-bow* lake. The steps in the process are shown in Fig. 17.

Lakes

Marked on the physical maps of the continents are large inland sheets of water known as lakes—some of the larger ones big enough to be known as inland seas. There is no need at this point to consider all the various ways in which the drainage of a certain area may concentrate at some point to form a lake, but really they are all caused by water collecting into a hollow and filling it. If the water in the hollow drains out again the lake has an outlet, and so the water in the lake is fresh water. If, however, the water is unable to find an outlet it only disappears owing to evaporation, and any soluble salts in the water will naturally be left behind. The water in the lakes thus becomes more and more impregnated and "salt lakes" are formed. Such areas, having no outlets to the main oceans, are known as *basins of inland drainage*.

In addition to, or sometimes instead of, becoming salt, these lakes tend to dry up. This is because the material brought down by the rivers is deposited on the floor of the lake, so making it shallower and thereby spreading the water over a larger area, so that evaporation becomes more rapid than the supply of water. Other lakes have been dried up by local changes in climate in the course of time.

EXERCISES ON CHAPTER III

1. Select two currents in the Atlantic and two in the Pacific and state their causes. (C.S.C.)
2. Explain why the Dead Sea is very salt while the Great Lakes of America are freshwater lakes.
3. Describe the course of a river.
4. In what stage of the course would you expect a river to be most useful to man?

CHAPTER IV

CLIMATE

THE consideration of the relationship between man and the atmosphere at once brings up the question of the changing conditions of the atmosphere that are experienced from day to day and month to month. These conditions and their daily variations, which are far from regular, especially in the British Isles, are known as *weather*. The fairly constant type of weather sequence experienced from year to year in a particular area is known as the *climate* of that area.

It is thus necessary to consider the many facts that must be borne in mind in a consideration of climate. The two main facts that concern man are *heat* and *moisture* because they affect his movements, and, more important still, determine the plant growth upon which he is dependent.

Heat.—The condition of a place with regard to heat or cold is known as its temperature. Heat is provided by the sun. So far as man is concerned, it is the actual temperature of the air which is the main consideration, and for this reason readings are taken with thermometers that are not exposed to the full rays of the sun but about which the air can circulate freely. Naturally the temperature

will vary from day to night, and the usual procedure is to use a "maximum and minimum" thermometer, which records the highest and lowest temperatures for the twenty-four hours, and then take the mean of the two readings as representing the air temperature for the day. From these *mean daily temperatures* the *mean monthly temperatures* are obtained by taking the total of the mean daily temperatures for each month and dividing by the number of days in the month. The *mean annual temperatures* are worked out by taking the total of the mean monthly temperatures and dividing by twelve. Since there are slight variations from year to year the last two are worked out from figures obtained over many years.

Moisture.—The earth receives its moisture mainly as rainfall. Water when exposed to air tends to evaporate, and the warmer the air the more water vapour it can absorb. Conversely, the cooler the air becomes the less water vapour it can hold. Thus, when air containing water vapour is cooled, the amount of moisture it can hold is immediately reduced and any surplus of water vapour above this amount is forced to condense, with the result that it forms rain, or in some conditions mist or fog. The evening mists that rise after a warm day, especially near marshes and similar places, are due to the cooling of moisture-laden air.

The simplest way for air to be cooled is for it to rise, for the higher it goes into the rarer air and the further it is from the heat absorbing and heat radiating earth the cooler it becomes. It is also cooled as it expands in rising into the more rarefied condition. (Think of the precautions against cold that explorers of the upper air have to take!)

Air is caused to rise, and consequently drop its moisture, in three main ways.

1. By being forced up the sides of a mountain while moving as an air current or wind. In this case the rise has been brought about by the build or relief of the land, and the consequent rainfall is known as *relief rain*.

2. By the air at any point being heated considerably and thus being made to expand and therefore become less dense so that it rises. As it rises it becomes cool—eventually cool enough to cause

condensation. These upward currents of warm air brought about by unequal heating are known as convectional currents, and rainfall thus caused is known as *convectional rain*.

3. In certain parts of the world, particularly in the area of the N. Atlantic, local conditions bring about variations in the density of the air. When the air is reduced in one place, the weight or pressure which it can bring upon that place is reduced and we say it is an area of low pressure. Thus local air systems are set up with low pressure in the centre. To this centre, air currents move and then rise, thus giving rise to rain. These pressure systems are known as cyclones and such rain as *cyclonic rainfall*. Such rainfall will be studied in more detail when considering the Northern Continents.

Minor facts of climate.—In addition to these two main facts of climate, there are others to be considered. Some of them are :

Winds.—An important part is played by winds in influencing climate as a whole, but they are also important in themselves, for neither plants nor human beings can thrive in strong and continuous winds.

Sunshine and Cloud.—It has been shown in recent years that mere warmth is not everything, but that the actual light rays of the sun have a beneficial influence upon growing things. Thus it becomes important to know to what extent the actual sun's rays are shut off from the earth by banks of cloud.

Humidity.—The condition of the air with regard to the actual moistures in the air, that is, the amount of water vapour it contains, is called its humidity. The warmer the air the more water vapour it can contain. The fraction

$$\frac{\text{amount of water vapour actually present at any temperature}}{\text{amount of water vapour air can hold at that temperature}}$$

is expressed as a percentage and is known as the *relative humidity*. This is a very important fact in the effect of climate upon us, for when a man exerts himself he tends to perspire. When the relative humidity is low, the air can evaporate that perspiration and, as the

process of evaporation itself leads to a loss of temperature, immediate relief is felt. When, on the other hand, relative humidity is high, little perspiration can be evaporated and he is correspondingly uncomfortable and less healthy.

Factors controlling Climate

The main factors are very closely linked and interdependent, and they may be summarized as follows :

1. **Latitude.**—The prime factor in temperature is latitude, for this determines the directness, and therefore the strength, of the sun's rays.

2. **Direction of winds**, taken in conjunction with the *position of land and sea*. Rainfall depends upon the condensation of water vapour in the air, and this water vapour comes from the evaporation of water, mainly over the sea. It is the *winds* that carry this water vapour over the land, where it is condensed in one of the ways noted (p. 29).

At the same time this is also a factor for modifying temperature. Water absorbs heat, and radiates heat, more slowly than land, and, as a result, during a hot period the sea is cooler than the adjoining land, but when the land loses its heat the sea does so more slowly, and so remains comparatively warm. If there is then a wind from sea to land, the sea will act as a cooling influence in summer and as a warming influence in winter.

3. **Altitude.**—Up to the highest point on the earth, the higher one ascends into the atmosphere the colder it becomes. Thus the height of a place directly modifies its temperature. The rate of decrease in temperature is roughly 1° F. for every 300 feet rise—though this is far from a constant figure, for it varies from 1° for 250' to 1° for nearly 450', according to the place and the circumstances, and these variations are often quite local affairs.

4. **Configuration.**—The shape of the earth's surface mainly influences the distribution of rainfall, for a mountain range near a coast line will confine the influences of a rain-bearing wind to the windward side of the mountain. This is perhaps best illustrated by

Fig. 18. In the same way, the position of high land limits the moderating influence of the sea upon an adjacent land-mass.

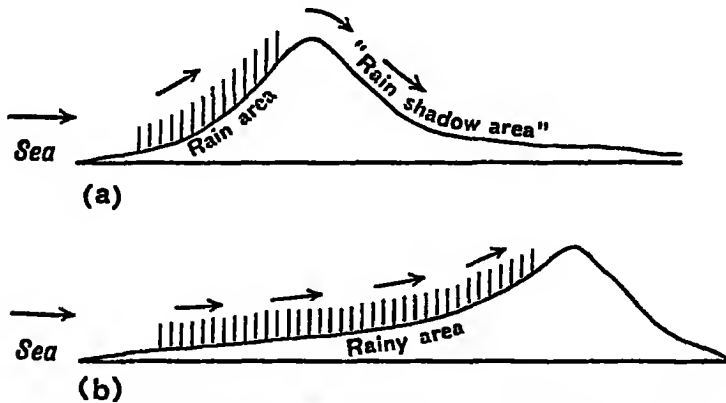


FIG. 18. INFLUENCE OF CONFIGURATION UPON RAINFALL DISTRIBUTION.

In (a) the mountains are near the windward coast, causing heavy "relief" rainfall, while the leeward slope is dry—note the name given to it.

In (b) the mountains are near the leeward coast, and the rainfall is distributed over a much larger area.

5. Ocean currents.—Regular movements of water in the ocean bring warm water into cooler latitudes, or vice versa. Winds are, however, responsible for making this influence felt, and the spread of such an influence is also determined by the configuration of the land. It would thus appear that the first two factors dominate the climate of any given place, and must be considered first. After that it becomes necessary to see whether local conditions allow these factors to have full play, or whether they introduce important modifications.

World Pressure and Wind Systems

Since the direction of winds is of such great importance in controlling the climate of a place, it is now necessary to study winds and wind systems in greater detail. A wind may be defined as the movement of air from one place to another above the earth's surface. This movement is brought about by an unequal distribution of air caused by many and rather complicated factors. The pressure of

air upon a place varies from time to time, according to the density of the air above the place ; and air tends to move from regions of high pressure to regions of low pressure. Thus, by observing the regions of high and low pressure on the earth, it is possible to find out something about the main wind systems of the world.

Now the main thing which will cause a lessening of air density or pressure is heating, for this will cause the air at that place to expand. Thus at the equator, where there is intense heating, the air tends to expand, lose its density, and rise, causing a very marked belt of low pressure. This upward movement of air is further accentuated by the rotation of the earth which sets up centrifugal force. The air which rises eventually comes to a layer of its own density, beyond which it cannot rise, and it then flows outwards towards the poles. The Polar areas, being cold, are naturally regions of high pressure ; and the lower layers of air tend to flow from these areas towards the equator. These factors, and others not at all clearly understood, lead to the formation of high pressure belts at about latitudes 30° N. and S. and further areas of low pressure between those latitudes and the belts of Polar high pressure. The belt of low pressure at the equator is known as the *Doldrums*, and since air movement is upwards it is a belt of calms. At the high pressure belts the air movement is downwards and these areas are also belts of calms, which are generally known as the *Horse Latitudes*.

On the earth's surface air currents move outward from these high pressure belts and form winds. Owing to the rotation of the earth they do not blow directly from high pressure to low pressure as might be expected, but are deflected. The cause of this deflection was first noted by Ferrel, who makes it apply to all moving particles on the earth's surface. For general purposes it is sufficient to say that, owing to the rotation of the earth, all winds tend to be deflected to the right in the northern hemisphere and to the left in the southern hemisphere. This deflection becomes more noticeable with increasing distance from the equator.

The pressure systems and the air currents they set up are shown in Fig. 19. The main wind systems thus shown are frequently known as the " planetary winds ".

The system of pressure and winds thus shown is that which might be expected to exist on an earth either covered entirely with land or sea, and with the sun overhead at the equator. It thus becomes

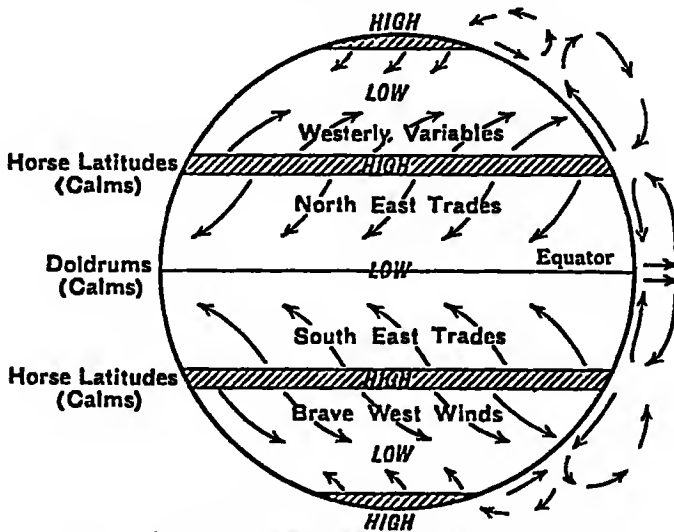


FIG. 19. WORLD PRESSURE AND WIND SYSTEMS (DIAGRAMMATIC).

necessary to consider these pressure and wind systems under the influence of the apparent movement of the sun, and of the unequal distribution of land and sea already noted.

Swing of the wind belts.—The apparent movement of the sun (see earth movements, p. 13) causes the region of greatest heat (*the Thermal equator*) to move between about 12° N. and 8° S., these figures not being the same because of the greater amount of land in the northern hemisphere and the slightly longer period which the sun is north of the equator. Since the heat of the sun is one of the main causes of the distribution of pressure, the pressure and wind belts also move with this migration of the thermal equator. The effect of this movement is best shown in Fig. 20. For simplicity the land mass is represented as a rectangular area.

Effect of the land masses.—As land heats and cools more rapidly than water, this is bound to influence the temperature, and therefore the pressure, of the air above the land or the sea. The

division of the world's surface between land and sea has had a very big influence in modifying the pressure and wind systems, so that there are at certain times and places big changes from those that have been given as prevailing in a globe of either all land or all water.

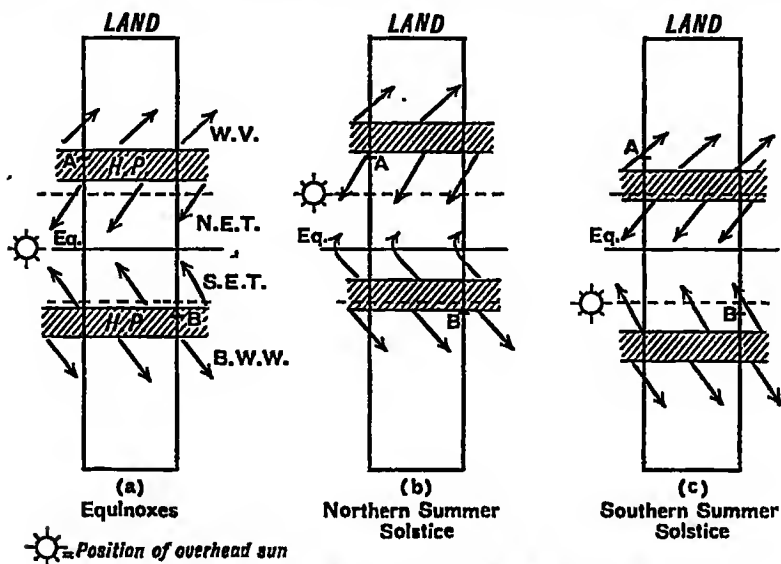
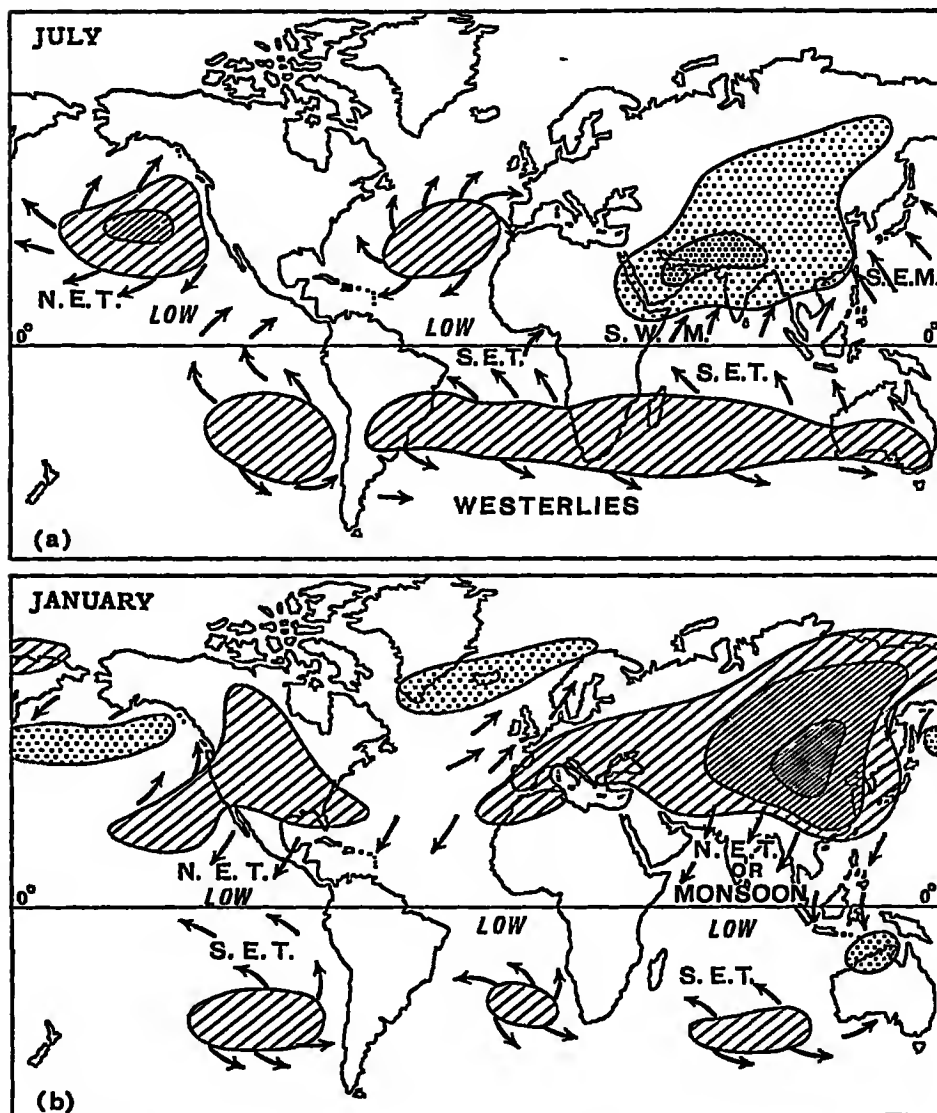


FIG. 20. THE " SWING OF THE WIND BELTS " FOLLOWING THE OVERHEAD SUN.

Note—(i) the varying influences affecting places A and B ;
(ii) the path of the South-East Trade Winds in (b).

A glance at a globe will show that land is very unequally divided between the two hemispheres, there being much more in the north than in the south. This causes the changes in the pressure and wind systems to be much more marked in the north. To understand these changes, study the two maps of world pressure and winds in July and January (Fig. 21a and 21b). Consider what happens. In July the big northern land masses become very hot and the air above then becomes less dense, and so rises and flows away partly over the cooler oceans. The high pressure belt of the Horse Latitudes is now found only over the oceans. From these high pressures winds swirl outwards. Notice their directions. In some places the winds are



 Marked High Pressure
  Marked Low Pressure

FIG. 21. WORLD PRESSURE AND WIND SYSTEMS.

normal, but in others the direction has been considerably affected. The land mass of Eurasia is so large that the low pressure over it

becomes very marked, and the South-East Trades from the southern hemisphere are pulled right across the equator and, being deflected, blow in a south-westerly direction over an area which should normally receive the North-East Trades. These reversed winds are known as *monsoons*.

In January, when the southern hemisphere is receiving the greater warmth, the northern land mass becomes intensely cold and a very marked high pressure system is formed over Eurasia. This intensifies the North-East Trades, and causes the westerlies to become more south-west, while in the east of the land mass north-west winds are set up. In the southern hemisphere the land masses are large enough to cause a break up of the high pressure belt, so that it is found only over the oceans, but they are not big enough to cause any big wind reversal.

Climatic Divisions

It is possible to divide the earth's surface up into regions according to their mode of formation or type of rock—or both. In considering the atmospheric conditions of the globe it is necessary to adopt the same method, and endeavour to find out the various types of climatic conditions that are distinct enough to separate one region from another.

In the brief study of the facts of climate the method of expressing temperature in terms of the "mean temperature" was touched upon, and these mean temperatures can be made use of in dividing the world into its climatic divisions. A consideration of the globe will show that there must be large areas near the equator which always have the sun's rays fairly direct, and are therefore always warm, while near the poles there are certain areas which are never very warm. So it would be possible to divide the world into a series of belts which would change from hot near the equator to cold near the two poles (the belts would, of course, be similar for each hemisphere). The ancient Greeks made use of this method, dividing the earth into what they called the "Torrid Zone, the Temperate Zone and the Frigid Zone".

If we use mean annual temperatures, it is possible to draw a

series of lines round the world connecting places with the same mean annual temperature. These lines of equal temperature are known as *isotherms*, and quite a good series of temperature regions can be made by using such a means.

There is one point, however, that must be considered. The reason for wishing to divide the world into climatic regions is to come to some understanding of the influence of any place upon the people living in it. Will mean annual temperatures do this?

A simple way of finding an approximate mean annual temperature is to take the mean monthly temperatures for the hottest and coldest months of the year, July and January in the northern hemisphere and vice versa in the southern, and find the mean between them. This is done for three places in the following table:—

	Place	Jan.	July	Mean
A.	Dublin - - -	42	60	51
B.	Budapest - - -	29	71	50
C.	Petro-Alexandrovsk -	22	83	52.5

All these places have about the same "mean" temperature, and yet they are not the same. *A* has a mild winter but not a hot summer; *B* quite a cold winter (Jan. is below freezing point) and quite a warm summer; while *C* has a definitely cold winter and a hot summer. It is hardly likely that all three areas would have the same influence on people living in them. To bring out this difference then, it is necessary to notice the difference in temperature between the hottest and the coldest months. This difference in temperature is known as the *temperature range*. In the examples given the temperature ranges are *A* 18, *B* 42 and *C* 61—thus bringing out the essential differences between these climates. Places which do not have a large range are known as "equable". When their temperature figures show a mild winter and not a very hot summer such places can be further distinguished as "temperate". Places with a big range are known as "extreme". Since unequal heating of land and sea brings about big differences in temperature, such variations are connected with the position of that place in regard to the sea. Thus places near the sea are cooled in summer and

warmed in winter by the influence of the sea, and so are usually equable. In the centre of big land masses—away from the equator—there is very unequal heating between summer and winter, and it is in such places that the really extreme climates are found. Hence an alternative name for the extreme climate is the "continental" climate.

A very simple division of the world according to temperature may be made as follows :

1. Places which always have the sun's rays fairly direct and are therefore always hot. Such places obviously lie within an area bounded approximately by the Tropics. They are frequently referred to as Tropical regions and they definitely form a *Hot Belt*. Since in this belt there is not much variation between winter and summer it is possible to use a "mean annual" isotherm, and that usually taken is 70° F.

2. Places just beyond the Tropics, which therefore never have the vertical midday sun, and also have the sun's rays at a comparatively low angle for part of the year. This first belt beyond the Tropics is known as the *Warm Temperate Belt*. It contains areas with a fairly hot summer and which, while having a definitely cooler winter, have no month the average of which falls below 43° F.¹

3. Places well beyond the Tropics, which never have the sun very high in the sky, and which, during part of the year, have the sun at so low an angle, and the days of which are so short, that there are from one to five months less than 43° F. This is the *Cool Temperate Belt*.

4. Places on the polar side of No. 3, which have more than half the year below 43° F. These are the *Cold Climates*.

5. Places which never have any really warm months (*i.e.* months above 50° F.²). These are known as *Arctic Climates*.

In this way it is possible to divide the world up according to various types of temperature regime. Temperature, however, is only one of the main considerations of climate. The other consideration is that of rainfall. There are various types of rainfall, but to mankind the method by which rain is caused is of no particular importance in his

¹Temperature required for continuous tree growth.

²The summer limit for tree growth.

everyday life. He is much more concerned with other aspects of the matter. He is concerned rather with two main things, viz. :
 (1) How much rain is received during the course of the whole year.
 (2) At what season or seasons of the year that rain falls.

These are the two main considerations, but it is also important to know "how" it falls—that is whether it comes in a gentle but continuous drizzle, or whether it comes in short but heavy showers, or storms with bright intervals in between.

Distribution of rainfall over a land mass.—The pressure and wind belts lead to the main areas of precipitation over any land mass. In the equatorial areas of high temperature and consequent low pressure there is regular convectional rain, while on either side of this lie regions of summer rain caused by the movement of the convectional rain belt, which follows the thermal equator.

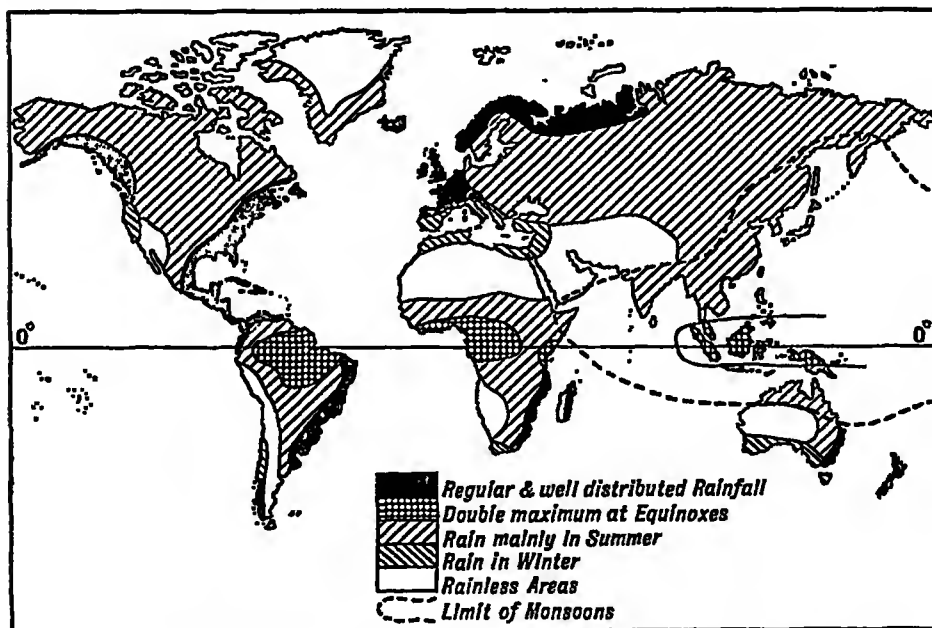


FIG. 22. SEASONAL DISTRIBUTION OF RAINFALL OVER THE WORLD.
 (After Austin Miller.)

The high pressure belts, with their down-pressing air—which is becoming compressed—are dry regions. The trade winds that

blow from them are dry, as they are blowing equatorwards and so are getting warmer and are capable of holding more moisture. On the eastern sides of land masses, however, relief causes rain in trade wind areas. The west wind belts are generally wet, as they contain air currents moving away from the equator. They are particularly wet on western margins, but cyclonic influences also bring rain on east coasts. Cyclones are most active in winter and so areas of cyclonic activity tend to have a winter maximum. On the other hand, interiors of land masses in these areas are high pressure regions in winter, so rain bearing winds can only penetrate to any extent in summer.

Seasonal movements, due to the apparent movement of the sun, cause the west wind belts to move equatorwards in winter, and so extend their influences nearer the equator.

Monsoonal areas naturally have their rainfall particularly in the summer months.

Thus in all save equatorial areas it is possible to divide land masses into eastern, western and interior areas according to rainfall.

Climate and Vegetation

Most people realize that vegetation depends on two main factors, viz., soil and climate. In a general world survey it is necessary to ignore the former and merely note the climatic control. This climatic control works primarily through heat and moisture, for if there is a sufficiency of warmth it is fairly safe to assume that there will be a sufficiency of light.

An important point to notice is that, for vegetation requirements, the mere fact of the amount of rainfall is not sufficient, for it may not all be what is known as "effective" rainfall—i.e. rainfall that plants can use. In hot areas there is a big loss by evaporation, so that what would be a sufficiency in a cool climate is far from that in a hot one. Also, much moisture may be lost by a rapid "run-off" in areas of heavy storms, or by rapid absorption by certain types of soils. Such details, however, are best left to be dealt with in their particular areas. It is sufficient here to lay down one or two general "rules"—though perhaps the word "rule" is rather too precise.

In areas of abundant heat and moisture there is naturally abundant plant growth. This produces thick forests and still leaves sufficient moisture for a rich undergrowth. There is a big struggle for light, and so the trees are tall and with few branches except near the top. As there is no cool or dry period, there is no need for a resting time and the trees are broadleaved evergreens of the hardwood type. The forest itself is often gloomy and dim. The heavy rains make much of the lower ground swampy, so that there are not many animals, save tree animals or amphibians, but there is an abundance of bird and insect life.

Where there is a sufficiency of moisture, but where low temperatures during certain periods lead to a resting period, there is forest of the deciduous type, in which the trees shed their leaves during a period of quiescence.

When temperatures are markedly low, the trees are of the coniferous type, being able to resist low temperatures and able to manage with only a short growing period. Owing to the small loss by evaporation in cool areas, quite low rainfall (about 15 in. per annum) is sufficient to maintain coniferous forest.

Where the rainfall is lower and seasonal, the vegetation changes. Such areas are the areas of grasslands, for grass, with a short cycle of growth, is able to withstand a period of drought. In the tropical areas this grass is coarse and high, and becomes scorched during the dry period. Where there is enough moisture, *i.e.* along water courses, there is a fair amount of tree growth. The tropical grasslands—known as *savannas*—are frequently referred to as “parklands”. The big grasslands of the temperate areas are, however, practically treeless.

In areas where rainfall is insufficient for grass, moisture-retaining plants of the cactus variety are found.

In the areas of winter rainfall an interesting type of vegetation has developed. Here are found plants that have so adapted themselves that they are able to retain, during the hot dry summer, the moisture they have obtained during the winter months, and this is the area of the thick and oily skinned evergreen shrubs, tough or thick barks, and long roots to reach deep water supplies.

In the Arctic areas there is not sufficient warmth for tree growth but during the short warm period there is time enough for the growth of mosses, lichens and similar types. Such type of vegetation is generally known as *tundra*.

EXERCISES ON CHAPTER IV

1. Explain the causes of (a) the midnight sun, (b) land and sea breezes, (c) a rain shadow area. (C.S.C.)
2. Explain why (a) as altitude increases, temperature decreases, (b) some rivers have deltas and others have not, (c) some lakes are salt. (C.S.C.)
3. Why are the greatest seasonal changes of temperature experienced in temperate latitudes? Where are those seasonal changes least, and why? (C.S.C.)
4. In what ways does convectional rainfall differ from relief rainfall? Give examples of each type. (C.S.C.)
5. In what ways do (a) ocean currents, (b) land masses, (c) high mountains influence the climate of a region?
6. Explain the difference between mean temperature and temperature range.
7. Why do temperate trees have "rings" marking annual growth, while equatorial trees do not?

CHAPTER V

THE MAIN CLIMATIC REGIONS OF THE WORLD

THE chief types of climatic regions which are to be found in the world are summarised below. At the same time, the main areas in which they are to be found are also shown, with notes on their vegetation types and an indication of the sort of productions that may be expected. These facts should be noted carefully, as they form a necessary foundation upon which to base a more detailed study of the various regions of the world. The numbering of these regions is used as a key to the climatic map (Fig. 23) and is also used in the later details of the various continents. It should, however, be borne in mind that this summary only gives broad outlines, and that each continent will show local variations dependent on shape and build. Also, though boundaries are given to the various areas, these are very rarely clearly marked in actual fact, but are rather regions of transition from one type to another. The productions indicate the type that may be found, but they are not all found in each particular area.

A. Hot Regions

Mean annual temperature of more than 70° F., with no great extremes. The characteristics of the main areas are as follows :

1. **Equatorial.**—Always hot—having a temperature range of only a few degrees. They are always wet, the rain being mainly of a convectional type, and there is a double maxima, most rain falling at the equinoxes. The rain comes in heavy showers in the afternoons and is frequently accompanied by thunderstorms.

Areas.—Amazon Basin. Congo Basin. Guinea Coast and a strip in the East African coast. The East Indies.

Vegetation.—Dense forest with tangled undergrowth.

Typical Productions.—Rubber. Palm Oil. Cocoa.

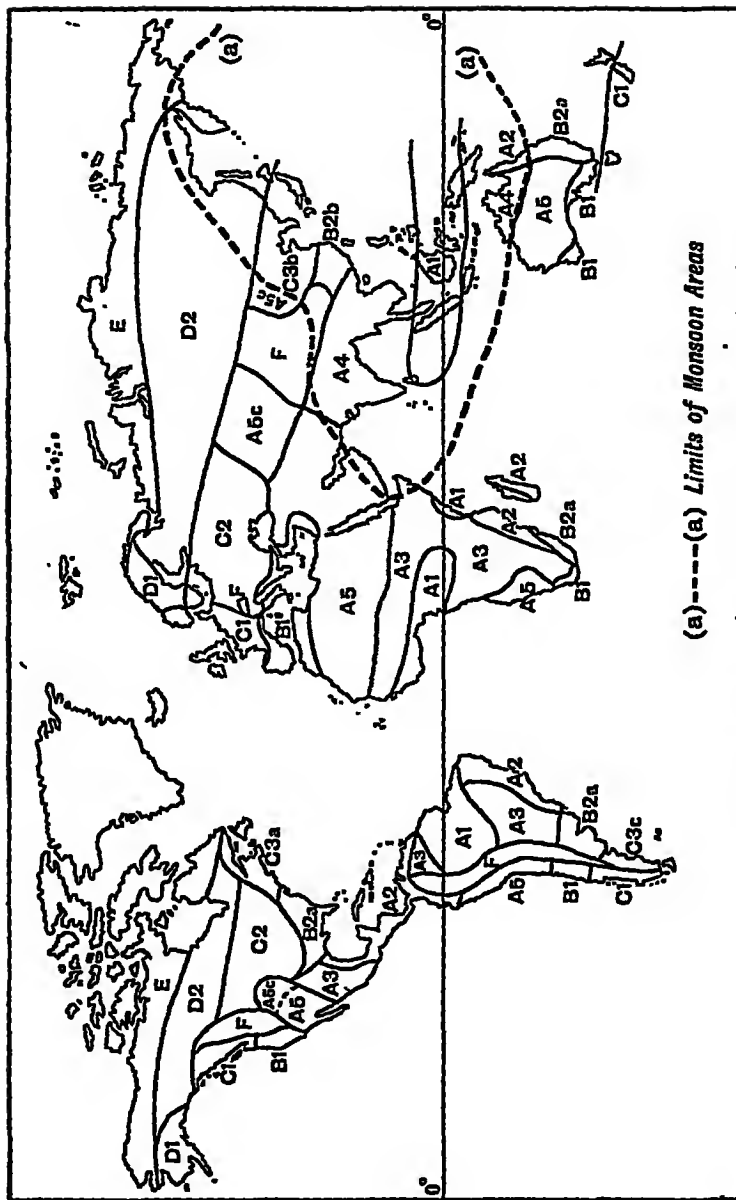


FIG. 23. CLIMATIC REGIONS OF THE WORLD. (After Austin Miller.)
Numbering corresponds with that in the text.

2. Tropical eastern margin.—Rain all the year from the Trade winds. In most areas there is a maximum in autumn, except near the equator, when it comes in summer owing to convectional rain.

Areas.—East Brazil. South-East Africa. East Australia. Central America and Caribbean Areas.

Vegetation.—Similar to A 1.

Productions.—Sugar. Cocoa. Rice (in lowlands).

3. Tropical interior.—Rain in the "summer" months (for causes see Fig. 20) but hot and dry when the vertical midday sun is on the opposite side of the equator.

Areas.—Interior of S. America (north and south of A 1). Sudan. Rhodesia.

Vegetation.—Savannas. Coarse grass, very tall in wet season but scorched in dry season. Trees scattered and mainly near water courses, and often having gummy sap in the drier areas.

Productions and Occupations.—Maize. Millet. Cotton. Coffee. Tobacco. Cattle Rearing.

4. Tropical monsoon.—Areas where the land mass is large enough to break up the regular pressure systems (see "Effect of land masses", p. 37). Rain comes in the summer months from inblowing winds. Rainfall varies with relief and proximity to the sea.

Areas.—India, Indo-China. N. Australia.

Vegetation.—Forests in wetter areas, with grass in drier regions.

Productions.—Teak and Bamboo in forests. Tea and Coffee on slopes. Rice. Oil seeds. Sugar. Jute and Cotton.

N.B.—The Monsoon climate is dealt with in greater detail in the sections on Asia, in which continent it shows its fullest development.

5. Hot deserts.—Situated on the west coasts of continents in Trade Wind Belts. They are always hot in the daytime, but nights are frequently very cold.

Areas.—Arizona. Sahara and Arabia. Atacama. Kalahari. West Australia.

Vegetation.—Found at oases (fertile spots owing to the presence of water from wells). Date palms, fruits and cereals can be grown. Life is often attracted to desert areas by mineral wealth.

5c. The areas without rain extend beyond the limit of the hot belt, and these extensions tend to have extremes of climate.

Areas.—Great Basin of Western U.S.A. Central Asia. East of the Caspian.

B. Warm Temperate Regions

Areas in which the summer is usually over 70° F. and have no month with less than 43° F. The following types may be noted:

1. *Western margin.*—Areas so situated that owing to the swing of wind belts they receive rain in winter from the westerlies but are hot and dry for the rest of the year (see Fig. 20). Since the best-known region with a climate like this is round the Mediterranean Sea, this type of climate is generally referred to as "mediterranean", though actually the Mediterranean Sea region has several variations from the true western margin type.

Areas.—Mediterranean Coastlands, California, Central Chile, Cape Town, Perth and Adelaide.

Vegetation.—Drought-resisting evergreens. Scanty pastures—but irrigation, combined with hot sunny summers, leads to abundant growth.

Productions.—Cereals. Fruits (citrus, grapes, etc.).

2a. *Eastern margins.*—Hot summers and mild winters, with a fair amount of rain all the year, but with a maximum in summer from the Trades.

Areas.—South-Eastern U.S.A. La Plata Estuary. South Natal. South-East Australia.

Vegetation.—Mainly forested, and containing many valuable cabinet woods. La Plata area is a grassland, the reasons for this not being very clear.

Productions.—Maize. Tobacco. Sugar. Cotton. Oranges.

2b. *Eastern monsoonal type.*—A local variation of B 2a. It has greater extremes of temperature and a very marked summer maximum of rain—as would be expected from the way in which monsoons are caused.

Area.—South China.

Vegetation and Productions.—Rice—which can be grown owing to the very hot summers. Tea. Sugar. Mulberries.

Note that there is no Interior region in this belt. If the land mass is broad enough to allow of it, it is also broad enough to give a big enough range of temperature to carry it beyond those limits which define this particular climatic belt.

C. Cool Temperate Regions

A definitely cool season of below 43° F., but this cool season does not exceed five months in duration.

1. **Western margins.**—Mild temperatures owing to the modifying influence of the sea. Rainfall is fairly uniform, with a tendency towards winter maximum. Owing to the big influence that the sea has upon their climates they are frequently called "marine" or "oceanic" climates.

Areas.—British Columbia and North-Western U.S.A. North-West Europe. South Chile. South Island of New Zealand.

Vegetation.—Forests—Deciduous and Coniferous, according to temperatures. Much of this forest has been cleared and replaced by cultivation.

Productions.—Timber. Cereals. Temperate fruits in the drier areas—e.g. in sheltered valleys.

2. **Interiors,** which are areas having extreme temperatures and rain falling mostly in summer.

Areas.—Central U.S.A., East Europe.

Vegetation.—Grasslands. Steppes. Prairies.

Productions.—Cereals (especially wheat). Cattle.

3a. **Eastern margin: cyclonic type.**—Because these are situated on the East Coast, they have extreme temperatures, as the sea has little modifying influence. Rainfall, being cyclonic, is fairly uniform.

Area.—North-Eastern U.S.A. and East Canada.

Vegetation.—Deciduous and Coniferous forest, much cleared for agriculture.

Productions. Timber. Wheat. Fruit (apples). Dairy Produce.

3b. Eastern margin: monsoon type.—Found to the east of the big Asiatic land mass. The temperatures are extreme—as in 3a—but the rainfall comes in summer from monsoons and the winters—unlike 3a—are dry.

Areas.—North China and Manchuria, and Japan (where the sea modifies temperatures).

Vegetation.—Grass or trees (coniferous and deciduous) according to rainfall and temperature. Trees mainly on slopes, where rain is heavier.

Productions.—Cereals—summer temperatures high enough for rice in some regions.

3c. Patagonia.—A dry area such as this is should normally be found on the east side in a west wind belt. It is really a rain shadow area behind the Andes. Temperatures are fairly extreme, but, as South America is so narrow, they are not as extreme as those of the Northern Hemisphere.

D. The Cold Regions

A long cold season, with more than half the year with a temperature of less than 43° F., so that only plants able to resist cold, and able to overcome the difficulties of a short-growing season, can survive.

1. Western margin.—Owing to the influence of the sea, these have a fairly uniform temperature. The coasts are ice free. Rainfall is fairly regular with a winter maximum. Owing to the low temperatures there is much snow, and there are many glaciers among the highlands.

Areas.—Alaska and Norway.

Vegetation and Production.—Coniferous trees—lumbering.

2. Continental type.—Here the sea has no influence, so there are extreme temperatures, the winters being exceedingly cold. There is a light rainfall with a summer maximum.

Areas.—North Canada. North Russia. Siberia.

Vegetation.—Conifers—with grasslands where the rainfall is less than 10 in.

Productions and Occupations.—Lumber and trees, with some pastoral farming, and the growing of hardy cereals such as rye and barley and some varieties of wheat.

E. Arctic Climate

Temperature is always below 50° F. There is a short summer with long days. Moisture condenses in the form of snow.

Areas.—Along the shores of the Arctic Ocean—"Barren Grounds" of North America—Tundra of Eurasia.

Vegetation.—Stunted bushes—mosses, lichens.

Occupation.—Hunting—but most human food comes from the sea (fish and seals).

F. Mountain Regions

Areas where mountains are high enough, and of sufficient extent, to introduce big variations of climate. Naturally, temperature will vary with their height from the temperatures at their bases, and rainfall will depend to a large extent on the prevailing winds of the area.

Areas.—Andes. Western Cordilleras of U.S.A. Alps. Central Asia.

Vegetation.—This will vary from that found at the foot, but often increased rainfall up the slopes will lead to forest, even where there is no forest at their base. Above these forests are often found pastures, most of which are available only at certain seasons of the year.

Occupations, etc.—Cattle rearing is often carried on, but each area has its own peculiarities, and they will have to be dealt with separately. Mining is often very important.

TYPICAL CLIMATIC STATISTICS

These figures should be used to draw a series of temperature graphs and rainfall charts. Try to obtain figures of your own locality.

T = Temperature in ° F. R = Rainfall.

Place	Type	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Manaos (3° S, 60° W)	A1 { T	80	80	80	80	80	80	81	82	83	83	82	81
	{ R	8.3	8.0	8.1	8.4	6.6	3.9	1.8	1.3	1.4	4.6	4.5	8.2
Rio de Janeiro (23° S, 43° W)	A2 { T	78	78	77	74	71	69	68	69	70	71	73	76
	{ R	5.0	4.5	5.3	4.2	3.2	2.3	1.7	1.7	2.6	3.3	4.1	5.5
Kayes (14° N, 12° W)	A3 { T	77	81	89	94	96	91	84	82	82	85	83	77
	{ R	—	—	—	—	0.6	3.9	8.3	8.3	5.6	1.9	0.3	0.2
Calcutta (23° N, 88° E)	A4 { T	76	76	80	83	86	84	81	81	81	82	81	77
	{ R	0.4	1.0	1.4	2.2	5.6	11.9	12.7	13.4	10.0	4.9	0.6	0.2
Lahore (32° N, 74° E)	A4 { T	53	57	69	81	89	93	89	87	85	76	63	55
	{ R	0.9	1.0	0.8	0.5	0.7	1.4	5.4	4.7	2.3	0.3	0.1	0.4
Cairo (30° N, 31° E)	A5 { T	55	57	63	70	76	80	82	82	78	74	65	58
	{ R	0.4	0.2	0.2	0.2	—	—	—	—	—	—	0.1	0.2
Palermo (38° N, 13° E)	B1 { T	51	52	55	58	64	71	76	77	73	67	59	53
	{ R	3.2	2.7	2.8	1.9	1.1	0.7	0.2	0.4	1.8	3.2	3.3	3.6
Perth (32° S, 116° E)	B1 { T	74	74	71	67	61	57	55	56	58	61	66	71
	{ R	0.3	0.5	0.7	1.6	4.9	6.9	6.5	5.7	3.3	2.1	0.8	0.6
New Orleans (30° N, 90° W)	B2 { T	54	57	63	69	75	80	82	81	78	69	61	55
	{ R	4.5	4.3	4.6	4.5	4.1	5.4	6.5	5.7	4.5	3.2	3.8	4.5
Chung-King (30° N, 107° E)	B2a { T	48	50	58	68	74	80	83	86	77	68	59	50
	{ R	0.7	0.9	1.3	4.0	5.3	6.7	5.3	4.4	5.8	4.6	2.0	0.9
Portland (46° N, 123° W)	C1 { T	39	42	46	51	57	61	67	66	61	54	46	41
	{ R	6.7	5.5	4.8	3.1	2.3	1.6	0.6	0.6	1.9	3.3	6.5	6.9
London (51° N, 0° W)	C1 { T	39	40	42	47	53	59	63	62	57	49	43	39
	{ R	1.8	1.7	1.7	1.7	1.8	2.3	2.6	2.4	2.2	2.9	2.2	2.1
Kiev (50° N, 31° E)	C2 { T	21	23	31	45	57	64	67	65	57	46	34	24
	{ R	1.1	0.8	1.5	1.7	1.7	2.4	3.0	2.4	1.7	1.7	1.5	1.5
Boston (42° N, 71° W)	C3a { T	27	28	35	45	57	68	72	69	63	52	41	32
	{ R	3.7	3.5	4.1	3.8	3.7	3.1	3.5	4.2	3.4	3.7	4.1	3.8
Peking (37° N, 116° E)	C3b { T	24	29	41	57	68	76	79	77	68	55	39	27
	{ R	0.1	0.2	0.2	0.6	1.4	3.0	9.4	6.3	2.6	0.6	0.3	0.1
Punta Arenas (33° S, 71° W)	C3c { T	54	51	48	44	39	36	35	37	40	44	47	50
	{ R	1.4	1.2	1.7	1.6	1.6	1.2	1.2	1.2	1.1	0.8	1.1	1.4
Trondhjem (63° N, 10° E)	D1 { T	22	26	31	39	46	54	57	56	49	41	34	28
	{ R	4.3	3.0	3.4	2.5	2.2	1.9	2.8	3.4	4.4	5.0	3.9	3.4
Barnaul (53° N, 84° E)	D2 { T	0	3	14	34	52	63	68	62	51	35	17	6
	{ R	0.8	0.6	0.6	0.6	1.3	1.7	2.2	1.8	1.1	1.3	1.1	1.1
Spitsbergen (78° N, 14° E)	E { T	4	-2	-2	8	23	35	42	40	32	22	11	6
	{ R	1.4	1.3	1.1	0.9	0.5	0.4	0.6	0.9	1.0	1.2	1.0	1.5

EXERCISES ON CHAPTER V

1. Describe (a) the distribution of the hot deserts of the Northern Hemisphere, (b) *two* different ways of living found in them. (C.S.C.)

2. What do you consider to be the three chief factors that influence the climate of a country? Give your reasons. Illustrate by reference to the British Isles, Natal or Japan. (C.S.C.)

3. Describe the types of climate to be found (a) along the coast of the Americas from Labrador to Patagonia, (b) from Bergen (Norway) to Cape Town.

Explain briefly the causes of the climatic changes that would be encountered in journeys between the places mentioned.

4. The equatorial forests are comparatively unimportant for the production of timber. Give reasons for this fact.

5. Where are the world's main grasslands? Describe the climate and development of any one of them.

6. Explain the differences between the climates of the eastern and western sides of the warm temperate regions.

7. What climatic variations are to be found within the limits of the monsoon regions?

PART II

REGIONAL GEOGRAPHY OF THE WORLD

HAVING briefly considered the world as a whole, it is now possible to study the various continents in turn. Obviously the first thing to consider about any area is its position. Therefore study a world map—or better still a globe—and note the relative positions and sizes of the continents. Observe, too, their positions with regard to the equator, and their comparative latitudes and longitudes. For example, South America is not immediately south of North America, but rather to the south-east; South America is nearly bisected by Longitude 60° W., North America by 100° W. In the same way note that North America is almost bisected by Latitude 40° N., Europe by 50° N. By making a series of similar comparisons, endeavour to get a clear mental picture of the positions, shapes and relative sizes of the continents.

The regional study will proceed along the following lines, for the reasons stated. First of all, the three southern continents will be dealt with in this order, Africa, Australia, South America. These three continents are taken first because they are less well developed than those of the north. Further, they are easily comparable, owing to their positions, so that the relation between their climates and developments may be noted. They are linked together in build. Also, since none of them is a big land mass, there are not very big variations from the climatic regions that have been noted in the preceding chapter, and so they give a simple climatic study.

After the southern continents, the northern continents will be dealt with. First of all, North America—because of its link with South America, the last southern continent which was considered. Also because, although it is a great land mass, large enough to cause

some climatic modifications, it is yet not big enough to upset the general climatic conditions completely.

Next Eurasia—a very large land mass—home of the old civilizations, and big enough to set up its own climatic controls. Asia will be taken first, as it is the home of very old civilizations in certain big areas, which can be dealt with in large units. Then Europe—the home of modern civilization—very elaborately organized politically and, therefore, economically. This calls for a more detailed study.

Finally the British Isles, taken last because it is reserved for a really detailed survey, of the type that people ought to make of their own country.

Try to keep this plan of study in view all the time.

The Southern Continents

Position.—Although these three continents are known as the southern continents, they do not lie entirely south of the equator. Take careful note of their relative positions—the main points to observe being :

1. While Africa is cut practically in half by the equator, South America lies mainly south of the equator and Australia entirely so.
2. South America extends considerably further south than either of the others.

If it has not already been done so for the previous section, take careful note of the most northerly and southerly latitudes of each of the three continents.

Build.—The most important feature in the build of the three continents is that they all contain remnants of an old unfolded plateau system. This old continent is known to geologists as *Gondwanaland*. In Africa this occupies almost the entire continent, and the only other important region is the area in the north-west occupied by the young folded Atlas mountains, part of the big east to west system of Eurasia.

In Australia the old continent forms the western plateau, and to the east is a highland area which is an old worn down mountain area. Between these two are the lowlands forming the basin of the

Murray-Darling river system and the basin of inland drainage to Lake Eyre.

In South America the plateaus of the east—Brazilian Highlands and Guiana Highlands—represent the relics of this old land mass. The most outstanding physical feature of the continent is the big, recently folded, range of the Andes along the west coast. Between these two areas are lowlands, forming the basins of three great river systems—the Orinoco, the Amazon, and the Parana-Paraguay-Uruguay.

CHAPTER VI

AFRICA

Build.—The plateau which forms most of Africa (Fig. 4) is made up largely of unfolded rock layers, despite its age. It is not, however, perfectly level, for a glance at a map shows that it is considerably higher in the east than in the west, while in the north-west, far from being a plateau area, the land is actually below sea level. Thus, as a whole, the continent is tilted from the south and east to the north-west.

Since it is unfolded there should be signs of rifting, and these are very evident. The descent from the plateau to the coast is everywhere steep, and the coastal plains are all narrow. As a result of this the rivers, above a short lowland course, are interrupted by rapids and waterfalls. This helps to explain why Africa, known to the ancients and circumnavigated before 1500 A.D., was until the end of the nineteenth century called the "Dark Continent". In the east and south-east, where the plateau is higher, the descent from the plateau is marked by a series of steps.

The most important sign of rifting in Africa, however, is found in the east, where the surface of the plateau is broken by the big

African Rift Valley. This is shown in the map (Fig. 24), but it can be fairly easily traced in an ordinary physical map by the series of long narrow lakes that have been formed on parts of the rift valley



FIG. 24. THE GREAT AFRICAN RIFT VALLEYS.

very distinctive region, the Atlas Mountains can be more fully dealt with in the detailed study of that region.

In the extreme south-west is another small area where folds are "pushed up" against the edge of the plateau. This too will be noted in the regional survey.

floors. The lakes in the western rift valley are important as forming part of the sources of the Nile and Congo rivers. Those in the eastern rift valley, however, are in the main without an outlet, and so are salt. Apart from these rift valley lakes, there are other lakes in Africa which have been formed by water filling up depressions in the surface of the plateau. Some of them, notably Lakes *Chad* and *Ngami*, are basins of inland drainage, but Lake *Victoria* is one of the sources of the Nile.

Brief references have been made to the rivers, and to the way in which their navigation is impeded. It will be seen that the main streams, the *Congo* and the *Nile*, flow with the main tilt of the plateau, but that the *Zambezi* and the *Niger* do not do so. Other features of the rivers can best be dealt with when dealing with the areas through which they flow.

The *Atlas Mountains* form part of the big east to west folds of Europe, and thus are part of the Alpine system. Since this part of Africa is a

Climate

Temperature.—Study the climate maps of Africa. As it all lies within thirty-five degrees of the equator it is a hot continent. However, although Africa is almost cut in two by the equator, the northern and southern portions are not equally heated, for as will be seen—especially by using a map marking actual temperatures—the northern portion is more heated than the southern. This unequal heating has already been referred to ("swing of wind belts", p. 34). This comparative coolness of South Africa is further explained by two main facts, viz. the smaller size of the land, especially noting that North Africa is adjacent to Eurasia, and the tempering influence brought about by the altitude of the plateau in Southern Africa.

The influence of ocean currents upon temperatures is shown by the lower temperatures in the west of South Africa, which are influenced by the cool *Benguella* current, as compared with those of the east coast, which are influenced by the warm *Mozambique* current.

Rainfall.—Consult maps showing the total amounts of rainfall received and the seasons in which it falls.

On the equator there is a patch of heavy convectional rain which falls at all seasons. It will be seen that this is not equally heavy across the continent owing to the plateau on the east. On either side of this are areas receiving convectional rain in summer only. This rainfall gradually decreases until, on the west coast, the desert area is reached, while in the east is the area which should receive relief rain from the Trade winds. The north, however, has desert stretching across the continent. This, of course, is due to the fact that to the east there is no sea, but the big land mass of Asia. The northern and southern extremities of Africa extend just far enough from the equator to receive winter rain from the westerlies on the west coasts.

Climatic Areas of Africa

From temperature and rainfall facts the following climatic areas may be noted in Africa. The numbers correspond with the map of

African climatic areas (Fig. 25), while the numbers in brackets refer to climatic regions of the world—to which reference should be made

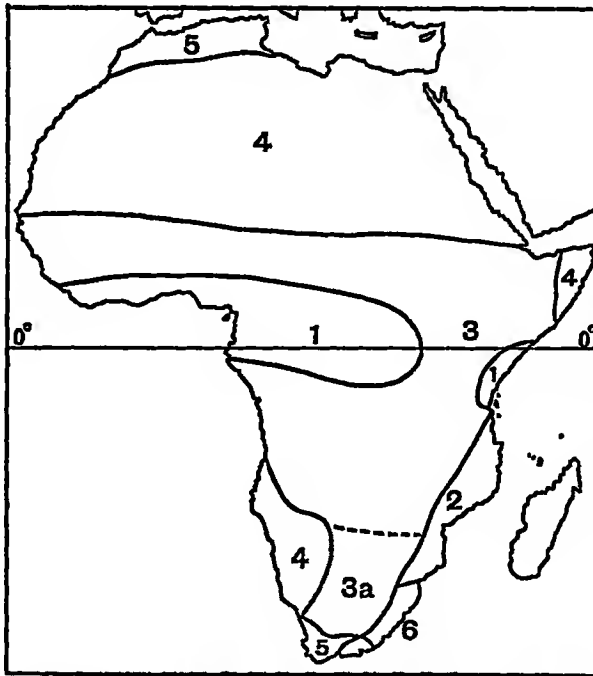


FIG. 25. THE CLIMATIC AREAS OF AFRICA.
Note the overlap of areas 5 and 6 in the south
—really forming a separate area.

for a general summary. The remarks about slight local variations are already being borne out.

1. Equatorial Area (A 1).
2. Tropical Eastern Margin (A 2).

3. Tropical Interior Type (A 3).—Notice that this includes the equatorial portion of the plateau, which, although it tends to have two rainfall maxima, yet in other respects is more characteristic of the tropical climate, owing to its altitude.

3a. In the south, this area has summer rain, which, however, is caused by the land becoming a low pressure area and allowing the South-East Trade winds to blow in. Altitude causes some modification of temperature.

4. Hot Deserts (A 5).—The small area in the east (The "Horn of Africa") is in the monsoonal regions, but as the monsoons here blow parallel to the coast they bring no rain.

5. Warm Temperate Western Margin, or Mediterranean (B 1).

6. Warm Temperate Eastern Margin (B 2a).

The south coast strip, owing to the shape and build of the continent, is influenced by climatic types 5 and 6 and, therefore, has rain at both seasons.

Vegetation Areas and the Human Development associated with them

The type of vegetation associated with particular types of climate has already been mentioned. The vegetation of an area tends to determine the life of the people who inhabit it. In Africa, which had a fairly large native population, the incidence of white civilization is of comparatively recent date, so that the types of civilization likely to develop naturally in the various vegetation zones can be fairly well observed, and form quite an interesting introduction to the study of the human geography of an area. The various areas must be taken in turn.

1. Equatorial forests.—Here vegetation is thick and luxuriant, in fact too thick and luxuriant, and as a result there is little animal life. Since primitive man is a hunter, this alone would prevent the forest from becoming thickly peopled. Moreover, the unhealthy climate and the great difficulty of movement in the forest would be other factors in causing such an area to be little used as a home by mankind. In the forests of the Congo the natural conditions of an equatorial forest are somewhat mitigated by its elevation and soil, so that, more particularly towards its edges, there is a fair amount of native life. In the heart of the forest are found a very interesting people—the pygmies. They are small in stature partly owing to lack of sunshine and good climate, but they probably represent the remnants of a very early type of people, the Negritoës, who once lived in Africa, and who were driven by a stronger group of races to take refuge in the less attractive parts of the continent.

They live in small groups, making their homes in simple huts of

grass and leaves, which can be easily erected after each move in search of food supplies. Their food is obtained partly by hunting the smaller animals and birds, and partly by gathering wild berries and roots. They are thus said to be at the "Hunting and gathering stage" of civilization.

In addition to these people are other and more advanced races, who cultivate the soil to a certain extent in order to grow manioc, sweet potatoes, bananas and similar tropical crops. Such races are also prone to change their habitation frequently, leaving their old clearing to be covered over by tangled undergrowth and small trees, rather than by the more valuable bigger trees which had been cut down and destroyed in its formation.

This primitive native life is now coming more and more under the influence of European civilization which, in return for the raw materials of the forests, wishes to trade its manufactured goods. So the natives have been encouraged (in some areas, it must regretfully be confessed, compelled) to gather or cultivate tropical products such as rubber and palm oil, while white people have gone there as traders, missionaries and government officials.

2. Tropical grasslands.—On these movement is comparatively easy, and the grasslands are the homes of many animals. This fact, and the better and more open conditions, have led to quite a large native population, in which it is possible to distinguish three main stages of development.

First of all, there is the more primitive type, which relies for its food supplies upon hunting. This is naturally somewhat precarious and involves a wandering life, with no really settled habitation for any length of time. Most African tribes have passed beyond this stage.

Second, comes the stage where the hunter has learned to domesticate cattle, so that there is a regular food supply, although hunting is still carried on to provide as much meat as possible. In tribes where wealth tends to be reckoned by the number of cattle possessed, a man does not kill his cattle save in extreme circumstances or for ceremonial purposes. A more settled life becomes possible under these conditions, but occasional moves in search of fresh pasture

and better hunting grounds take place. Typical of this stage are the natives of South Africa, living in their villages or *kraals* of beehive-shaped huts made of branches, leaves and mud and surrounded by a *zarcba* or thorn fence to keep out marauding wild animals. Near the village are patches of cultivated land in which the women cultivate crops of maize and millet by primitive means.

The third stage is that of the agriculturist, who lives a settled life and depends entirely on his crops and his cattle. This enables a permanent home to be established and more comfortable methods of life to be adopted. The food supply becomes much more certain. With increased time, opportunities and needs, a certain amount of simple-manufacture often develops—such as iron work for tools, pottery, leatherwork, the manufacture of cloth and so on. This type of development is to be found in the northern grasslands of Africa, known as the *Sudan*, where are to be found many settled peoples, who live together in big walled towns built of mud and sun-dried brick. Among them is a fair amount of trade and commerce, and trade is also carried on with the forest areas to the south and the desert areas to the north. This area too, under white influence, is now producing cotton and other crops suitable for the world market.

The deserts.—As these areas are without vegetation it would be thought that no human life can be associated with them. However, two important facts have to be borne in mind. First of all, there is no sudden change from grass to desert, but a slow transition giving quite a large area of rather poor vegetation—very coarse grass, cactus and thorn bush—which is known as *semi-desert*. Secondly, water can be carried very long distances by layers of water bearing rock, and in this way, where such a layer comes to the surface there may be a supply of water although the rain clouds bringing it may have dropped their moisture in some very distant place. In the Sahara there are many such places, and they are known as *oases*. They are very important, for not only do they enable crops to be grown and life to be supported in their immediate neighbourhood, but they also make travel across the desert possible.

Thus, in the Sahara, two types of life may be distinguished. At

the oases are settled agriculturists, who also carry on some trade with passing caravans. Wandering on the edge of the desert, or about it in certain areas near groups of oases, are less civilized and more warlike tribes who are nomadic herdsmen, traders, slave raiders, robbers and fanatical religious warriors according to circumstances. Modern transport is, however, now bringing even this difficult area under the control of the ever widening European civilization.

In the Kalahari districts, where the area of real desert is much less, there are found two peoples who also represent the remnants of the weaker early inhabitants of Africa. These are the Bushmen, another dwarf race related to the pygmies, and the Hottentots, a slightly stronger but still backward race. The Bushmen are hunters who lead a very precarious existence, so that their numbers remain low. They can hardly be said to build houses in the true sense, but rather put up rude shelters in the course of their continual wanderings. The Hottentots do manage to keep a few cattle on the poor pasture lands, and thus are somewhat more advanced than the Bushmen, but they are lower down the scale of civilization than are the stronger tribes who drove them from the grasslands.

The Mediterranean areas.—In these areas of winter rain there is little pasture to provide for an uncivilized native population, but such areas are very well adapted for agricultural purposes, and with proper cultivation (often needing irrigation) yield rich crops of wheat and fruits. The southern region round Cape Town had no particular development until it was opened up by the white people, who made it first a port of call for the East; before their coming it was inhabited by Hottentots. In the north there is a very different story, for the area borders the Mediterranean Sea, round which arose the great civilizations of the ancient world. As a result it developed very early. First of all it was the home of a branch of the great trading race, the Phoenicians, and as a centre of trade and industry flourished to the extent of challenging Rome for the supremacy of the Mediterranean world. Following a long period of unimportance it again became important, this time as a centre of a Mohammedan civilization under the Moors, a warlike people who were yet experts in the arts of irrigation, so that the region became rich and prosperous,

but at the same time, notorious for piracy and slavery. Now, under French rule, agriculture and commerce are flourishing once again, for in the regions with this type of climate man has opportunities for great advancement if he is able to take advantage of them.

This, then, is the background for the study of Africa. In this brief survey of native types there has been frequent reference to European influence. Africa was the last continent to come under this European influence, but in the last half of last century it was divided up into "spheres of influence" and colonies by the Great Powers, which were searching for markets for their industries and sources of supply for their needs. A glance at a map will show that these colonies obviously developed by extending inland from the coast. Reference has already been made to the difficulties that hindered the opening up of the interior. In order to study the present political and economic development of the continent it is necessary to divide it up into a series of big natural regions—regions with a similarity of development brought about by various factors, and these regions will be dealt with in turn.

EXERCISES ON CHAPTER VI

1. Draw sections showing the build of Africa (a) at the Equator, (b) at the Tropic of Cancer, (c) at the Tropic of Capricorn.
2. In what ways did the build and climate of the continent of Africa hinder its exploration and development?
3. Compare the Sahara and the Kalahari under the headings (a) extent and climate, (b) peoples, (c) influence upon route and history.
4. What parts of Africa are inhabited by (a) Berbers, (b) Arabs, (c) Pygmies, (d) Zulus? Select *two* of these peoples and show how their lives are adapted to geographical conditions. (C.S.C.)
5. Show how the relief and structure of Africa have affected the navigability of the rivers, and show the relation between the various types of lake and the relief and structural features of that continent. (L.G.S.)
6. How far do the political divisions of Africa coincide with natural regions? (O. and C.S.C.)
7. How would you divide Africa into natural regions based on climate and vegetation? (Scot.C.)

CHAPTER VII

NORTHERN AFRICA

The Nile Basin

Position.—Lying in the north-east of Africa, this area is unified by the river which drains it. A glance at a map will show that the Nile, drawing its water from Lakes Victoria, Albert and Edward in the equatorial plateau area, drains northward across a series of climatic and vegetation belts. Most striking point of all, it flows across a vast stretch of desert, thereby causing a long and narrow oasis.

Course and climate.—The course of the Nile, its tributaries, and the main climatic facts of the regions through which it flows, are shown on the sketch map (Fig. 26). They should be noted carefully—the climatic facts being compared with the work already done on the climatic regions of Africa. The area marked as the “Sudd” region is caused by the very small drop in the course of the river at that point (just over 200 ft. in 1000 miles). The river is therefore very sluggish and its course is blocked by big masses of weed known as Sudd.

Nile floods.—One of the best known features of the Nile are the floods, which have enabled civilization to exist on its banks for thousands of years. These floods can be understood if climatic maps are consulted. They show three controls operating.

The Nile rises in an area of fairly regular and heavy rainfall, and this enables it to flow across a large rainless area despite a big loss by evaporation.

The part below its source flows through an area of summer rains and so there would tend to be a slight increase of its flow in summer anyhow, though not a great deal owing to increased evaporation.

Its main tributaries come from the Abyssinian Highlands, and from there comes water from the summer monsoon rains.

[CHAP. VII.]

NILE VALLEY

65

[CHAP. VII.]

NILE VALLEY

65

Most of this summer flood water comes along the *Blue Nile*, although some also comes along the *Sobat*. The floods of the Blue Nile cause the river to begin to rise at Khartoum in May, and the floods do not reach their maximum there till September. Further down the river the flood occurs later still, not being felt till June at Wadi Halfa and Cairo—and the maximum rises at those places comes in September and October respectively. A normal "flood" causes a 25 ft. rise, and previously when the river fell below this, there was often a shortage of water.

Irrigation.—This flood was made use of by the inhabitants of the lower Nile valley, or Egypt, from prehistoric times. Irrigation was of two types :

- (a) *Basin Irrigation*—the water being held on the land for some weeks in a series of closed-in areas or basins. Silt was thus deposited on the land and added to its fertility.
- (b) *Perennial Irrigation*—water being raised from the stream by primitive *shadufs* and *sakias*.

Both are still in use, but the most important modern development has been the building of big *barrages* across the stream, which hold back most of the flood water and let it out during the dry seasons, thus making perennial irrigation more effective. The first method prevents crops being grown during the period of greatest heat.

The main *barrages* are at *Aswan* and *Asyut* in Egypt, and more recently, one has been built on the Blue Nile at *Sennar*.

Egypt

Regions and products.—*The Delta*—or lower Egypt. This is very thickly peopled, the native peasants (known as *fellaheen*) cultivating very small holdings. With modern methods of irrigation it is now possible to obtain three crops a year, as follows :

Autumn Crops.—Maize, millet, rice and vegetables which are planted on land above flood level while the Nile is high.

Winter Crops.—Wheat, barley and clover (used for feeding cattle) with peas, lentils and similar crops.

Summer Crops (only possible with perennial irrigation).—Cotton, and sugar. Cotton is the main "cash" crop of the country, the

fibre being of good (long) quality and so finding a ready market in the important cotton spinning regions of Europe, especially, of course, Lancashire.

In order that such heavy cropping shall not exhaust the soil, different crops are grown in different years (*crop rotation*) and much artificial manure is imported.

The Valley of the Nile—or Upper Egypt.—Here the amount of cultivable land is limited to a narrow strip some five to ten miles wide, for the Nile is flowing in a trough which it has cut for itself in the plateau, which is here comparatively low. Below Aswan the Nile flows in a broad alluvial valley across limestone country, but above it there is a sandstone region, with granite outcrops that cause the *cataracts*. The crops are similar to those of the Delta, with the addition of dates.

The Oases.—Lying in hollows to the west of the Nile Valley are several oases. The chief of these is *Fayum* which is actually part of the Nile irrigation system. Their crops are similar to those of the Nile Valley—dates being particularly important.

Towns.—The main towns are found in Lower Egypt. *Cairo*, the capital, is a large city standing at the head of the delta, and so controlling routes both east and west, and along the river valley. *Alexandria*, the main port, is situated to the west of the delta in order to avoid the effect of an east flowing current. It has railway and canal communications with Cairo. *Damietta* and *Rosetta* are small ports at the mouths of distributaries of the same name. The main town of the valley is *Aswan*.

Anglo-Egyptian Sudan

Products.—This occupies the middle course of the Nile, and stretches from forest lands in the south to desert in the north, but the main part has savannas. Thus cattle rearing is quite important, and attempts are being made to improve the rather poor type of native cattle. In the forest areas of the south the collection of rubber and ivory is of some importance. In the north, where it is drier, gum arabic is the main product, the gum being made from the

sap of a tree, which has a gummy sap in order that it may better resist the dry conditions.

The most important product, however, is *cotton*, which is now grown on the Gezira Plain between the Blue and White Niles and which is irrigated by the Sennar dam.

Towns.—*Khartoum*, at the confluence of the Blue and White Niles, is the main town of the area. It is connected by rail to *Port Sudan* on the Red Sea. *El Obeid* is the main collecting centre for the gum industry.

The Atlas Lands

Position and build.—In Chapter VI it was stated that in the north-west of Africa was a region of young folded rocks, the Atlas Moun-

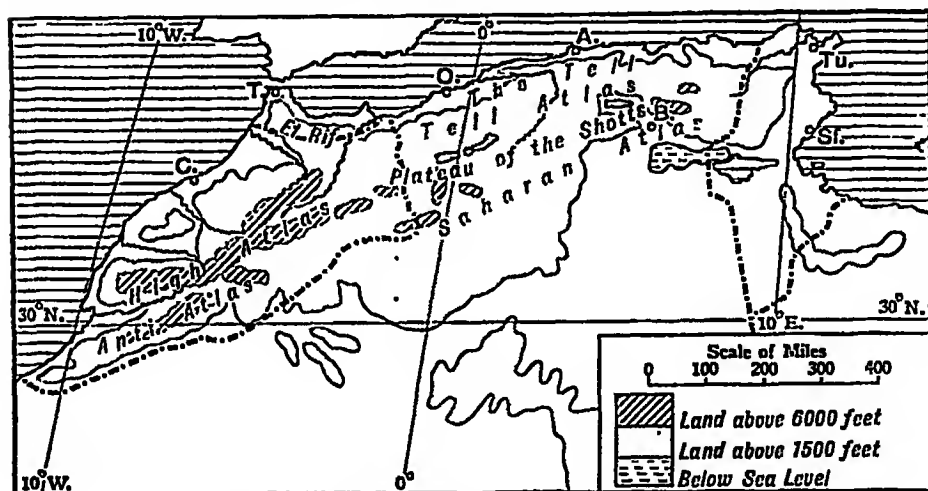


FIG. 27. THE BUILD OF THE ATLAS LANDS.
The colonies and towns marked should be identified.

tains, connected with the alpine folds of Europe. The sketch map (Fig. 27) shows that this formation gives rise to a roughly parallel series of ridges, and that the two main ridges enclose a broad valley—broad enough to be known as the *Plateau of the Shotts*. The Shotts are the salt lakes that have been formed by the inland drainage of this valley. Along the Mediterranean coast is a fertile plain known as the *Tell* and behind this rise up a coastal range and the Tell Atlas.

Other details of the build can be seen in the map and section (Figs. 27-28). This region is shut off from the rest of Africa by a big trough, which is so low that some parts of it are below sea level.

Climate.—This area is a region of Mediterranean climate with winter rainfall (Region 5). As may be expected, the build has a considerable influence on the distribution of rainfall, and this is shown on the section (Fig. 28). Rainfall also diminishes from west

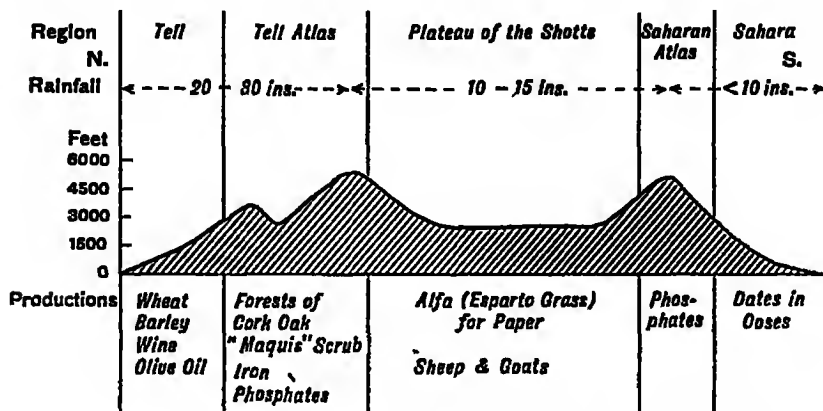


FIG. 28. SECTION GIVING A SUMMARY OF THE BUILD, CLIMATE AND PRODUCTIONS OF THE ATLAS LANDS.

to east, and, owing to the shape of the land, very little falls east of the gulf of Gabes.

Political divisions.—Before going on to the productions of the area, the present political control of the region should be noted. Mention has already been made of the historical associations of the area. Most of the region is now under French control. The main *French* spheres are in the colony of *Algeria* and the protectorate of *Tunis*, while French control is now established over a good deal of *Morocco*. There is a small *Spanish* sphere in *Morocco*, and *Tangiers* is an international zone. The Moroccan area is really only just coming under the control of the European powers.

Productions.—As has been mentioned, with irrigation, areas of Mediterranean climate are very productive. The most productive area of the Atlas lands is the Tell, and even here irrigation is neces-

sary. The French are developing the irrigation in this region and so are increasing its productivity. The main productions are *wheat, barley, vegetables, wine and olive oil*—the first three being general, but wine coming mainly from Algeria and olive oil from Tunis. The dry plateau of the Shotts is practically a semi-desert, and so is only suitable for pastoral occupations, *sheep and goats* being reared in considerable numbers. The peculiarities of the climate cause any grasses that may grow to be tough and fibrous. One particular variety, known as *Alfa* or *Esparto Grass*, is especially valuable in the making of paper, and large quantities of it are exported from this region.

The mountains contain considerable mineral wealth. *Iron* is mined behind Oran and Constantine, while *phosphates* (which are exported for use as fertilisers) are found near Constantine and in the regions behind Sfax and Casablanca.

In the trough south of the Atlas area are several oases, and by sinking artesian wells the French have added considerably to the fertility of existing oases, and, here and there, have created new ones. These oases are mainly noted for the production of *dates*, which are exported from Tunis. The main oasis is that of Biskra.

These production facts are summarized on the section (Fig. 28)—a method of revision which should be noted.

Towns.—The chief towns are the ports of *Casablanca, Oran, Algiers* and *Tunis*. From these ports railways run inland to serve the plateau of the Shotts and the oases. There is also a main east to west route from Tunis to Oran. Motor roads are being developed, especially inland. These transport systems owe a good deal of their development to the necessities of the military control of the area by the French. *Tangiers*, the natural port of Morocco, has declined in importance since the French area of Morocco became more fully developed.

With these improved transport facilities the region is now becoming a popular tourist centre, tourists being attracted partly by the climate and partly by the picturesque native peoples and towns, for it represents the area of oriental civilization most accessible to western travellers.

Tripoli.—Lying to the east of the Atlas region is the Italian colony of Tripoli (in studying a colonial map it should be remembered that Italy entered the colonial field very late). Being further east it is an area of lower rainfall, so that it is mainly a region of pastoral occupations. However, some cultivation is possible with the aid of wells, and *barley*, *dates* and *olives* are important articles of production. An interesting product are the *sponges*, which come from the sponge fisheries off the coast,

The Sahara

Since the Sahara is under French control it can be treated in this chapter. The area must not be thought of as one big sandy region, for though parts of it are made up of shifting sand dunes, there are areas of bare sandstone rock, and others of stony desert. In the centre is the *Ahaggar* plateau which reaches a height of over 6,000 feet.

The type of life to be met with has already been discussed (p. 61). It only needs to be added that modern transport, in the form of caterpillar-wheel motors and aeroplanes, is enabling the French to bring this region under some sort of control, and to say that the old caravan routes across it are now declining in importance with the falling away of the slave trade and the opening up of the west coast ports of Africa.

EXERCISES ON CHAPTER VII

1. Describe the course of the Nile from source to sea, with special reference to the climate and vegetation of the regions through which it flows. Illustrate your answer by a sketch map. (S.L.C.)
2. With the aid of sketch maps, account for the growth of Cairo, Alexandria and Khartoum.
3. What effects have the building of barrages had upon (a) the flow of the Nile, (b) the productions of Egypt, (c) the life of the fellaheen?
4. Describe the relief and climate of Morocco. How do these factors affect the occupations of the inhabitants? (C.S.C.)
5. What trade would be carried on between Marseilles and the French areas in North West Africa?

6. Why are the main towns of the Atlas lands situated upon the coast?

7. Show how relief affects climate and production in North-West Africa.

CHAPTER VIII

TROPICAL AFRICA

West Africa

Position and build.—This area is taken to include the land lying south of the Sahara, and from the British colony of Nigeria westwards—i.e. from about 15° N. to the equator, and west of 15° E.

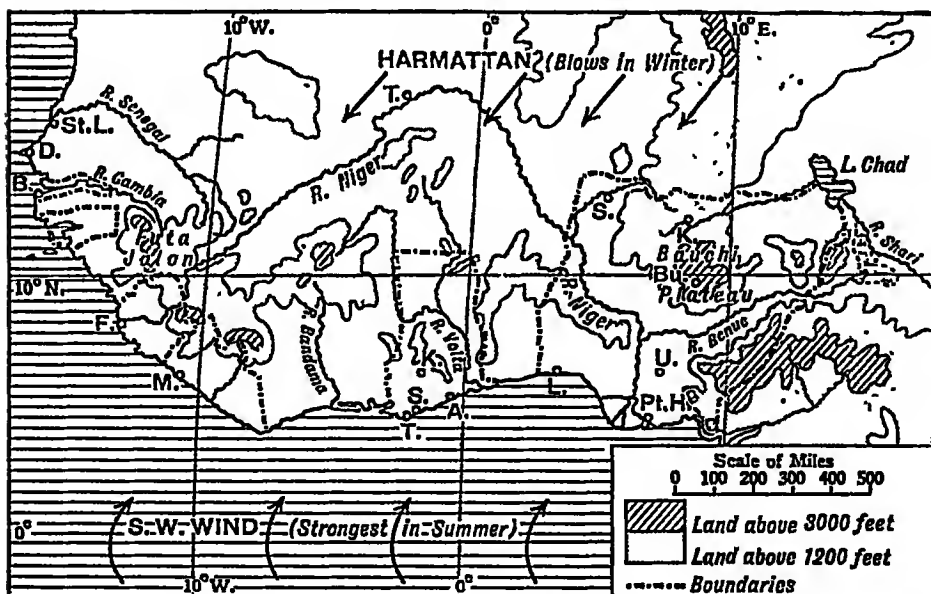


FIG. 29. WEST AFRICA.

Identify political divisions and towns marked. Draw a section showing build, climate, vegetation and products (after the style of Fig. 28).

As the map (Fig. 29) shows, it has a comparatively simple build, there being two main features to notice.

The coastal plain—varying in width but seldom exceeding 200 miles wide. This is crossed by a series of rivers, and is broadest in Nigeria, where it is formed partly of the Delta of the Niger. Notice the smoothness of the coast, along which there are few harbours, but which is made up of many surf-beaten sand bars, so that approach to it is difficult.

The plateau area—which rises steeply from the plain, and then tilts away gently inland. It reaches its highest point in the *Futa Jallon* highlands, in which rise the main rivers. Note particularly the courses of the Senegal and Niger, both of which flow inland before eventually turning to reach the coast. Naturally these rivers are hampered by rapids. The Niger is only navigable from the coast up to Rabba.

Climate and vegetation.—Comparison with climatic and vegetation maps will show that the coastlands come in the equatorial regions (No. 1) and the plateau in the tropical areas (No. 3). Reference to the chapter on the swing of the wind belts will explain one important point about the climate of this west coast. In the northern summer the South-East Trades are pulled north of the equator, and blow on to the coast as south-west winds, and so bring considerable rain, though they have a slightly lowering effect on the temperature.¹ In the northern winter strong north-east winds tend to blow frequently and bring dry conditions down to the coast. This dry wind is known locally as the *Harmattan*, and, as it is dry, it brings relief from the humid conditions that usually prevail.

The coastal plain is thickly forested, save in a rather dry area near the Volta river, and along the coastal margins there are unhealthy mangrove swamps. The plateau is savanna land which gradually gives place to semi-desert to the north.

Productions and occupations.—West Africa is one of the tropical

¹ West of Cape Three Points there is a patch of lower rainfall, which is due partly to the shape of the coast and partly to an upwelling of cold water off the coast (see chapter on Ocean Currents). This lower rainfall is clearly noticeable on a vegetation map.

areas which has come under white influence. Europeans were first attracted here by the trade in gold, ivory and, more particularly, slaves. Nowadays, however, the region is a source of supply for a variety of tropical products, which are needed in manufacturing processes, or as foodstuffs for the crowded manufacturing lands.

One important natural product was rubber, but this is now of little importance. The main local productions that have found a place in the world markets are palm oil, made from the fleshy pulp of the fruit of a palm tree, and palm kernel oil, which is extracted from the kernels of this fruit. These are exported from the coastal areas particularly of Sierra Leone, the Gold Coast and Nigeria.

Another local nut of importance is the Kola nut, which is chewed by the natives for its stimulating properties, and is used in making drugs. This is grown mainly in the Gold Coast area. One of the most important products is the cacao—from which cocoa and chocolate are made. It is not a native of the region, but has been introduced from South America. So successful has the introduction been, however, that the Gold Coast now produces about half the world's supply of cocoa, and there are important plantations in Nigeria as well.

Coconuts, which yield fibre and oil, are grown in some of the sandy areas of the coastal plain.

On the drier plateau the natives were cattle rearers and agriculturists before the coming of European influence; an old native production of cotton is being fostered and developed in North Nigeria round Kano, and the French are hoping to develop it in the region along the Niger.

In the west, where the Senegal and Gambia rivers flow west to the sea, a drier region is noted for the production of ground nuts (so-called because the fruit spikes force their way under the surface of the ground before ripening). From these nuts valuable oils are extracted.

In addition to these tropical products there is considerable mineral wealth. In Nigeria there are coalfields round Udi and there is an important tin production round Bukuru on the Bauchi plateau. In the Gold Coast there are gold and diamonds in the area

behind Takoradi, and *manganese* production is now becoming very important in the Black Volta valley in the north-west.

Colonies and towns.—The area is mainly occupied by French and British colonies. The French first colonized from the Senegal river, and from here worked eastward along that river and the upper Niger, so that their colonies consist of the plateau area, with occasional branches to the coast. Their chief towns are *St. Louis*—the old centre—*Dakar*, a modern port, and *Timbuktu*, an old caravan centre where the Niger reached its big northward bend towards the Sahara. Notice the railway connecting the navigable reaches of the Senegal and the Niger.

The British areas were gradually extended inland from the coast. They are as follows :

Gambia is a very old settlement along the river Gambia—capital *Bathurst*.

Sierra Leone was mainly used as a region to which to repatriate liberated slaves. The capital is *Freelown*, situated on a good harbour in the Rokelle river.

The Gold Coast extends well inland owing to the Volta river. The chief towns are *Sekondi* and *Accra*, old ports, though much of the trade is now being carried on through *Takoradi*, a modern deep water harbour. The main inland town is *Kumasi*, which has railways to Accra and Sekondi. Motor roads are being made to open up the interior.

Nigeria is a large colony with a big population. It extends inland as far as Lake Chad. The main towns are *Lagos* and *Port Harcourt* on the coast, and *Sokoto* and *Kano*, old native caravan centres on the plateau. There is considerable railway development, the main lines running inland from Lagos and Port Harcourt to Kano, while there are also many motor roads in the interior.

In addition to the French and British areas there is also a small Portuguese area, and the independent state of *Liberia*—founded as a home for freed slaves from the U.S.A. It has a small production of coffee in addition to palm-oil and rubber. Its chief town is *Monrovia*.

The islands in the Gulf of Guinea are noted for their production of cocoa.

in the same latitude will be dealt with at the same time, though this west coast area as far south as the Kunene river is often known as *Lower Guinea*.

The Congo flows in a great curve in a depression on the plateau, and then breaks through the western rim and descends by the *Livingstone Falls* before it crosses the narrow coastal plain (see Figs. 30 and 31). The waterfalls are a big handicap to the navigation of

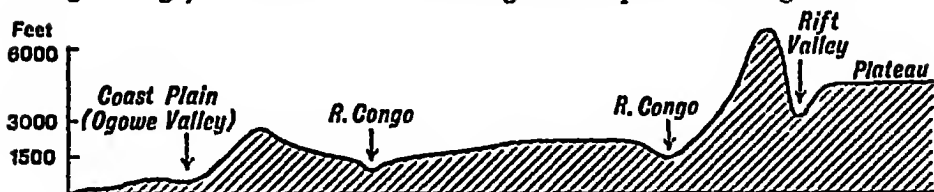


FIG. 31. SECTION OF CENTRAL AFRICA—ABOUT 1° S.

Note that the Congo is flowing in a depression of the plateau. Copy this section and add to it details of vegetation and production.

the river. There are other falls (the *Stanley Falls*), where the river leaves the eastern plateau to enter the depression, but, between these falls, the main river and its tributaries provide many miles of navigable waterways. The main tributaries are the Ubangi on the right bank and the Kasai on the left bank.

Climate and vegetation.—Comparison with the climatic map will show that most of the area is in the equatorial region (No. 1), though north and south this tends to merge into the tropical type (No. 3) especially in the seasonal distribution of its rainfall.

The vegetation is mainly equatorial forest, thinning out into savanna, while the highlands of the western rim bring savanna vegetation nearer to the equator than might be expected. Further, many stretches of the Congo basin contain porous soil, and these have more open forests than is usual in equatorial areas.

Areas and productions.—*French Area*—(*French Equatorial Africa and Kamerouns Mandat*).—The most important part of this area is the coastland which is very similar in climate and production to West Africa, so that *palm oil*, *cocoa* and *rubber* are the main products. The most fertile area is in the Kamerouns region. The highland areas consist of savanna lands, but so far these are even

less developed than the coastlands. The main towns are *Libreville* on the coast, and *Brazzaville*, which is the chief French trading centre of the Congo.

Belgian Congo.—This is a large area which, after a very chequered career, is now developing more rapidly than at one time seemed likely. It is still hampered by difficulties of transport, which have already been mentioned. *Rubber* was for a long while the main product, but it is not now very important. Considerable developments of the *palm oil* industry have taken place in the areas round the lower Kasai. Another important product is *copal*. This is a fossilized gum which is collected from swamps and river beds. It is used in the making of varnish. *Cacao* and similar tropical products are also grown, and the altitude makes the growth of cotton and coffee possible, though neither is as yet very important.

Probably the most important developments in the region will take place further south in the *Katanga* district, which is a rich mineral area. The principal mineral is *copper*, which is mined round *Elizabethville* and *Bukama*. *Iron* is also found in this region, and *diamonds* have been found further north, though they are not of any great importance. The main difficulty of this area is its inland position, but its importance is shown by the railways which have been built to it. Note that two of these have their outlets through Portuguese ports. Note also the means by which the hindrances to Congo navigation have been overcome. A further handicap of the area is the shortage of local foodstuffs, but here again, the railways are overcoming that difficulty by bringing them from surrounding areas.

The main towns of the Congo are naturally to be found on the river. *Matadi* is the main port, and from it a railway, avoiding the Livingstone Falls, runs to *Leopoldville* the capital, situated on Stanley Pools, above the Falls. *Stanleyville* stands at the head of the navigable area of the main stream.

Angola is a Portuguese colony. It has some equatorial areas in the north and along the narrow coastal strip, but it is mainly an upland savanna country, which in the south merges into semi-desert

conditions (compare its boundaries with the climatic map). In the north *rubber* and *palm oil* are of some importance, while in the south the main crops are *sugar*, *maize*, *coffee* and *tobacco*. The savannas naturally lead to *cattle rearing*. The region is not at all well developed, but the recent opening of the *Benguella railway*, designed to serve the Katanga region, should provide a big stimulus to the region, as it opens up the savanna and puts the region in touch with an important local market for foodstuffs. The main town is *Loanda*, a port which has a railway serving the interior. The Benguella railway actually runs from the port of *Lobito Bay*, and not from the old port of *Benguella*.

East Africa

Build.—The high plateau of East Africa has been mentioned several times, while in the chapter on the build its famous rift valley system has been referred to also. A further sign of the rifted formation of the plateau is the way in which the plateau descends by a series of steps to the coastal plains, which are narrow here as elsewhere in Africa. The great lakes, which are such a feature of the map, have already been mentioned in Chapter VI.

The highest part of the plateau is found in the north, in the area usually referred to as the Abyssinian Highlands. Further south, several peaks, some of which are of volcanic origin, rise from the surface of the plateau, the chief being Mts. *Elgon*, *Kenya*, *Ruwenzori*, and *Kilimanjaro*. Some of these are high enough to be in the region of perpetual snow and ice.

Climate.—The plateau has a big influence on the climate of the area, for its altitude is sufficient to cause considerable modification in temperature and rainfall. The coastlands have an *equatorial climate* (No. 1) near the equator, but further south gives way to the *tropical eastern margin* (No. 2). The "Horn of Africa" is a region of *desert* for reasons already discussed (p. 59). Thus the coastlands in the south are areas of *hot wet forests*, but in the north these give way to areas of *semi-desert*.

The plateau is usually considered to have a tropical type of climate (No. 3), though it should be noted that the rainfall distribu-

somewhat dry, while the regions near the lakes are usually wet enough for forest.

Productions.—These naturally vary considerably over the area. The wetter portions of the coastal plain produce *rice* and *sugar*, but the main production is *coco-nuts*, which yield two important articles of commerce—the fibre, known as *copir*, and the dried kernel, known as *copra*, from which oil can be obtained.

In the drier parts of the coastal plain, round the “Horn of Africa”, pastoral occupations, producing skins and hides, are of more importance, but the Italians are developing the growth of *cotton* with the aid of irrigation.

Before the coming of the white man the natives of the plateau reared cattle and grew *maize* and *millet*, and white influence is endeavouring to make progress by improving native methods of cultivation and improving the cattle. Owing to the altitude large areas of the plateau are suitable for white occupation, and a fair amount of settlement has taken place, though this is mostly dependent on native labour. The main centre of white settlement is Kenya, and here *coffee* is the main crop.

Other important crops of the plateau are *sisal*, a fibrous plant from which *hemp* is made, and *cotton*, which is grown mainly in an area to the north of Lake Victoria. *Orange* growing is also developing, and in some of the drier parts of the region, more particularly in Tanganyika, *ground nuts* are important.

Abyssinia is mainly a region of primitive farming, the chief exports being *hides* and *skins*, but it is interesting as being the probable home of coffee.

There is a certain amount of mineral wealth, notably the recent *gold* discoveries near Lake Victoria in Kenya, and the *soda* which is obtained round Lake Magadi.

Divisions and towns.—Most of the area is now under British control, in the colony of *Kenya*, the protectorate of *Uganda* and the mandated area of *Tanganyika*. *Abyssinia*, until recently an independent country, is now under Italian rule, and between it and the sea lie the Italian colonies of *Eritrea* and *Somaliland*, and *French* and *British Somaliland*.

The main port of the area is *Mombasa*, built on an island just off the coast of Kenya. The modern port is *Kilindini*, and from there the *Uganda railway* runs through *Nairobi*, the capital of Kenya to *Kisumu* and *Jinja* on Lake Victoria.

The main port of Tanganyika territory is *Dar-es-Salaam*, which has a good harbour. From it the *Central railway* runs to *Kigoma* on Lake Tanganyika, while there is a branch from *Tabora* to *Mwanza* on Lake Victoria.

Short railway lines also run inland to serve plantations from *Tanga* and *Lindi*, but it will be seen that the main railway lines are designed to link up the lakes and their transport with the seaports.

Off the coast of this area lie the islands of *Zanzibar* and *Pemba*, an old sultanate now under British protection. Zanzibar was once the main trading centre of the east coast, being particularly noted for its slave market. The islands are now mainly noted as being the chief source of *cloves*, a spice made from the dried flower buds of a tree.

Madagascar

Position.—Lying off the east coast is the large island of Madagascar, which was once attached to the mainland, though it is now shut off from it by the Mozambique channel. The vegetable and animal life indicate that this separation took place at a comparatively early period, many of the species of the mainland not being found on the island.

It is like Africa in being a plateau which is highest on the east. The main portion of the plateau is above 3,000 ft. in height. The coastal plain on the west is fairly broad.

Climate and vegetation.—As might be expected from its position and build, climatic conditions in Madagascar resemble those in Southern Africa. Thus there is heavy rain on the east coast, but less behind the eastern rim of the plateau, where rain comes mainly in summer when the trade winds can penetrate.

The island position tends to maintain fairly equable temperatures which are quite high (70°-80° F.).

The east coast is forested, but the plateau is an area of savanna.

which in the south-west gives way to comparatively poor grassland.

Development.—The island is now under French control. The main native race, the *Hovas*, have eastern origins.

Various tropical crops are cultivated, of which the chief are *rice* in the lowlands, *tobacco*, *sugar* and *cotton*, while *maize* and *manioc* are important food-stuffs. As yet there has been little export of any of these products, but the island does export *rafia*, which is made from the leaf of a palm, and *vanilla* which can only be grown in hot wet island areas.

On the plateau area the natives carry on *cattle rearing*. The mineral wealth has as yet been little developed, the only two minerals in which Madagascar plays any important part in world trade being *graphite* and *mica*. Graphite is found chiefly in the east of the plateau and mica in the south.

The main region of population is on the eastern side of the plateau. Here is situated the capital *Antananarivo*, from which there is a railway to *Tamatave*, the chief port, situated on the east coast. The port on the west coast is *Majunga*.

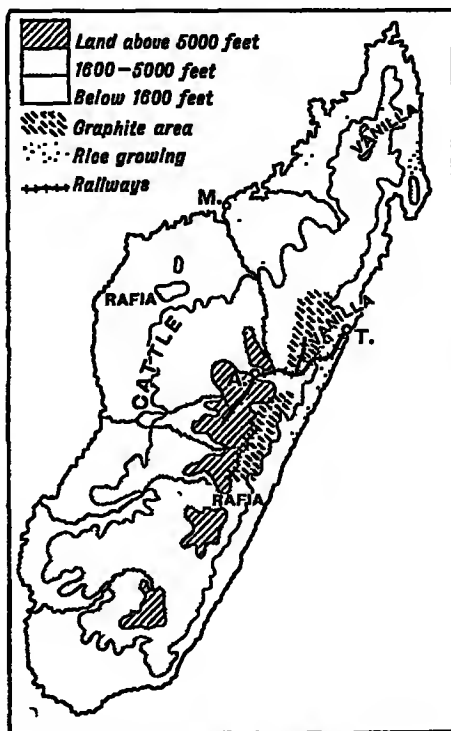


FIG. 33. MADAGASCAR.

Note—(i) tilt from east to west;
(ii) production areas.

Reunion and Mauritius

Lying considerably further east of Madagascar are the two comparatively small islands of Reunion, which is French, and Mauritius, which is British.

Both are of volcanic origin and both have considerable rainfall, especially in the summer months. Both have sugar as a main crop, but as Mauritius has been able to obtain a plentiful supply of coolie labour from India, it is able to produce much more than Reunion, despite its smaller size. The main town of Mauritius is Port Louis, which is situated on a good harbour on the more sheltered west coast.

EXERCISES ON CHAPTER VIII

1. What special advantages of climates, labour and communications has the Gold Coast for the production of (a) cocoa and (b) minerals?
(C.S.C.)
2. In the areas between the Sahara and the equatorial forest, describe (a) the climate, (b) the vegetation, (c) the occupations of the inhabitants.
(C.S.C.)
3. What are the two types of town in Nigeria? Describe the reasons for the importance of a characteristic town of each type.
4. Describe the value of the Congo from the point of view of trade and commerce. Compare it with the Niger.
5. What changes have taken place or are likely to take place in the development of the Belgian Congo?
6. Discuss the importance of the Benguela railway.
7. Describe the position of the savanna lands of East Africa, and compare their situation and development with those of West Africa.
(C.S.C.)
8. Write an account of the growing of (a) cotton, (b) coffee in Uganda, and show how labour and communications have influenced their development.
(C.S.C.)
9. Explain in what ways position and relief affect the climate of Madagascar. Write a description of the products and trade of the island.
(C.S.C.)
10. Compare and contrast East Africa and West Africa under the headings (a) build, (b) climate, (c) development.

CHAPTER IX

SOUTHERN AFRICA

Position and build.—Southern Africa includes all the south of the continent, practically from 10° S, though it should be noted that Angola, which extends to about 17° S., has already been dealt with owing to its connections with the Congo basin.

This southern area mainly consists of a plateau, with its highest rim in the east, the edge of the plateau there forming the *Drakensberg Mountains*. The lowest part of the plateau is found in the basin of the *Orange River*, which, like the Congo, flows in a depression, although this is not quite so marked. In the east the rivers are mainly swift streams flowing down the steep eastern slope, but two

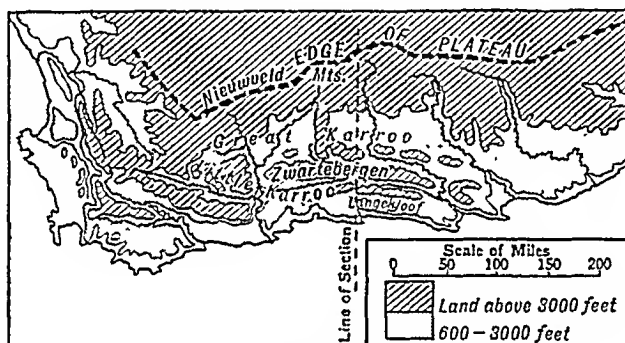


FIG. 34. FOLD AREA OF SOUTH AFRICA.

Note the direction of flow of the rivers.

big rivers (the *Zambezi* and the *Limpopo*) have broken through the plateau rim, and drain eastwards from the plateau. Like other African rivers, none of the South African rivers is of any real value for navigation.

In the south-west a section would seem to indicate that the step-like edge associated with rifting is very marked, but in actual fact this is not so, for there is a small folded area in the south giving a

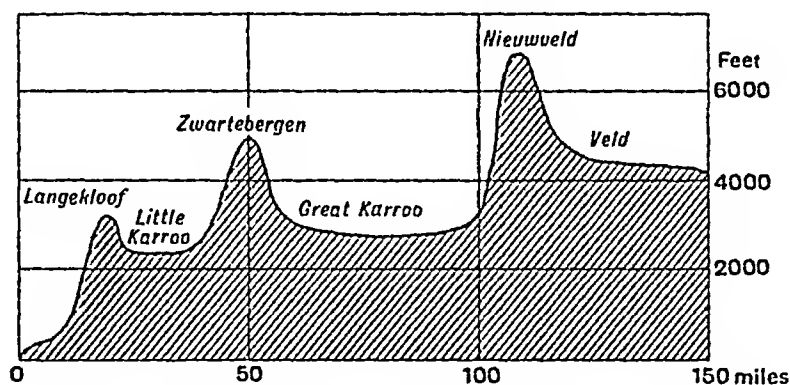


FIG. 35. SECTION OF FOLD AREA IN SOUTH AFRICA.
(Not on same scale as map in Fig. 34).

series of ridges and valleys known as the Karroo region (see Figs. 34 and 35).

Climate.—Comparison with climatic maps will show that this region lies mainly in the area of the South-East Trade winds, so that the heaviest rainfall is experienced on the east coast, especially

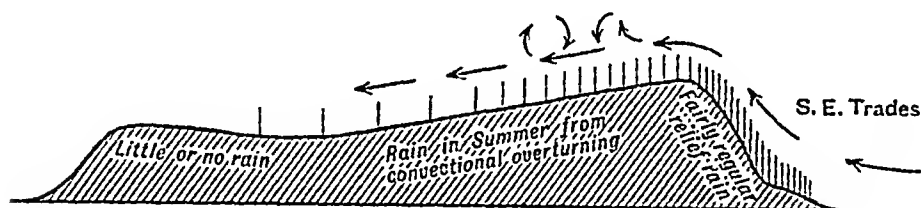


FIG. 36. WEST TO EAST SECTION ILLUSTRATING THE INFLUENCE OF RELIEF UPON RAINFALL DISTRIBUTION IN SOUTH AFRICA.

in summer and autumn, when the winds are more moisture laden. The structure of South Africa is important in the distribution of the rainfall, as Fig. 36 shows. Behind the eastern rim the plateau receives its rain in summer, mainly in the form of short storms. The rainfall of this area is irregular. South Africa extends far enough south to receive winter rain from the westerlies. The effect of

currents on the temperatures of the coasts has also been mentioned, while altitude plays an exceedingly important part in modifying the temperature enough to make this region earn the name of "White Man's Africa".

The climatic regions of Africa included in this area are :

2. Tropical Eastern Margin.
3. Tropical Interior.
- 3a. Modified Tropical Interior owing to altitude.
4. Hot Desert.
5. Warm Temperate Western Margin (Mediterranean).
6. Warm Temperate Eastern Margin.

Numbers 5 and 6 overlap slightly for a narrow strip along the south coast, giving an area of regular rains. These areas should be noted on the map of the climatic areas of Africa (Fig. 25).

Vegetation.—In the whole of Southern Africa the only regions where forests may be expected are along the wetter eastern coasts, and in the lower valleys of the Zambezi and Limpopo rivers. The greater part of the plateau is a grassland region. In the more tropical north this is typical savanna, but in the south, where the rainfall is less reliable, there are no trees. The general name for the plateau grassland is veld—subdivided by rainfall into the bush veld, which is found in the north, especially in the Limpopo valley, the middle veld, which occupies comparatively wet areas, especially round a height of from 4,000-5,000 ft., and the high veld, the big treeless grasslands found mainly in the south of the plateau. To the west the area becomes more and more arid, and semi-desert conditions are found, the Kalahari really only having a very small area of pure desert. The Karroos, being shut off by the ridge formation also tend to be arid.

Since the region is rather too large and complex to deal with as a whole, it will be easier to take the main political regions as units, especially as these are big enough to have certain characteristics of their own.

Tropical South Africa

The Rhodesias.—These are the self-governing colony of *Southern Rhodesia* and the Crown colony of *Northern Rhodesia*. They lie to the north of the area, and so contain the more tropical portions of South Africa. This, and their inland position, makes them less well developed than the areas to the south.

Farming.—Since the natural vegetation is grassland, the native populations were cattle rearers, and white settlers have developed this *cattle rearing* by improving stock, so that cattle exports are becoming important. The building of railways to provide rapid transport has made dairying possible in certain districts.

The main food crop is *maize*, while *tobacco* is also grown in considerable quantities. Comparison with the tropical areas north of the equator suggests the possibility of cotton growing, and experiments in this direction have been made, but as yet there is no very important production. The opening up of the *Katanga* mineral district has provided a new market for the foodstuffs produced in this area.

Mining.—The area has considerable mineral wealth, the main minerals being as follows :

Coal is mined at *Wankie*, just south of the famous Victoria Falls, and is valuable for the railways of the region, while it is also exported to the Katanga area.

Gold is found in a series of places lying chiefly in a district between *Bulawayo* to *Umtali*.

Asbestos.—This fibrous metal, with its fireproof qualities, is not found in many parts of the world, so that the production in Rhodesia is important. The asbestos area lies between Bulawayo and Victoria, mainly round *Mashaba*.

Chrome ore, which is used for making stainless steel, and which is therefore of rapidly increasing importance, is mined chiefly round *Selukwe*.

Copper and *zinc* are mined round *Broken Hill* in the north in a region which may be regarded as an extension of the Katanga district.

Towns.—In such a region there are naturally no large towns, the main centres being mining or trading centres along the main lines of transport. *Livingstone*, in N. Rhodesia, has an interesting site near

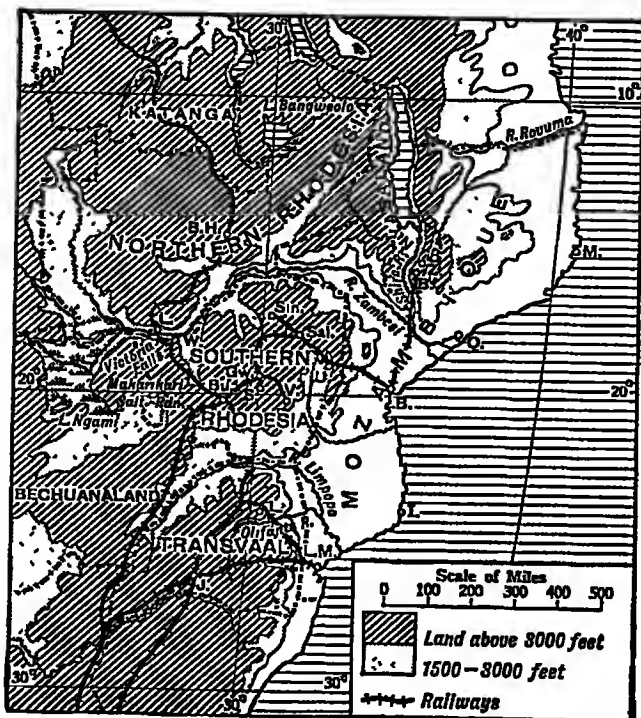


FIG. 37. THE RHODESIAS, NYASALAND AND MOZAMBIQUE.
Identify the towns.

- Note—(i) the broad coastal plains;
(ii) the rivers "cutting back" into the plateau rim;
(iii) the position of the mining towns of Southern Rhodesia;
(iv) the regions served by the port of Beira.

the narrow gorge into which the Zambezi plunges some four hundred feet to form the famous *Victoria Falls*, which attract a fair amount of tourist traffic. *Salisbury* (the capital), *Bulawayo*, *Sinoia* and *Umtali* are all important local centres in Southern Rhodesia. The last named stands near a break in the eastern rim of the plateau, which

gives a rail route to *Beira*, a Portuguese port, through which much Rhodesian trade passes.

Nyasaland

This protectorate, as its name suggests lies on, but does not entirely surround, Lake Nyasa, a rift valley lake. It is not a very accessible region and so has not been very well developed, although white settlement has taken place in the higher areas, particularly on the Shire Highlands. The natives grow crops of millet, rice and sweet potatoes, but the white settlers have developed other crops using native labour. Their main productions are tobacco and cotton, while some tea and coffee are grown on the slopes of the Shire and Nyasa Highlands.

In common with many other parts of tropical Africa, cattle keeping is difficult owing to the ravages of the tse-tse fly—which is one of the scourges of the continent, for in addition to carrying cattle disease it also spreads the dreaded “sleeping sickness”.

In such a region there will be few settlements of any size, the main ones being *Blantyre* and *Zomba* in the Shire Highlands. The Shire river, which drains Lake Nyasa to the Zambezi, is of little use for navigation. Note, however, the construction of the railway to *Chinde*, a port on the Zambezi, across which a bridge is now being built to link up the area with Beira. Boats on Lake Nyasa and the *Stevenson road* from Lake Nyasa to Lake Tanganyika provide means of transit northward.

Mozambique

Portuguese East Africa, occupying a very important position on the coast and the lower slopes of the plateau, lies between the British areas and the sea. The coastal plain is here fairly broad, as it contains the Zambezi's delta and the low land southward to the mouth of the Limpopo, which river has cut rather a broad low valley back into the eastern rim of the plateau.

In the north the region is tropical and the main productions are *sugar* in the Zambezi area and *sisal* and *copra* around *Quilimane*. Further south the temperatures are somewhat lower and the most

important crop is cotton, which is grown in the Limpopo district. Native crops are similar to those of Nyasa. As a whole, however, climate and history have prevented the region from becoming very well developed.

Towns.—Although this rather points to a lack of important towns, the importance of the region's position has already been mentioned. The ports of the seaboard serve not only their immediate hinterland, but also serve as the outlets for the heart of Africa. In the north is Beira. Railways make this the present or future outlet for Katanga, the Rhodesias and Nyasaland as well as for the north of Mozambique itself, in which there are deposits of coal, which may be important as the railway development continues. In the south of the colony Lourenço Marques serves as an outlet for some of the produce of the Transvaal.

The Union of South Africa

A self-governing British Dominion, this is made up of the old colonies of Cape of Good Hope and Natal, and the old Boer States of Orange Free State and Transvaal. These last two, founded by the Boers or descendants of the old Dutch colonists, were independent until the Boer war, when they were annexed, but they were soon given self government in common with the English States. The history of this area, with its very recent story of war between the two peoples, naturally introduces racial difficulties from time to time, but these are becoming less common. The main problem in the Union is the "colour" problem, a question further complicated by the introduction of "coolie" labour from India, a practice which has now been stopped.

It should be noted that Bechuanaland, Basutoland and Swaziland, which are mainly native areas, are protectorates, while South-West Africa is a mandated territory.

The climate and the vegetation of the region have already been considered at the beginning of the chapter.

Agriculture.—Owing to the seasonal character and the uncertainty of the rainfall over most of the area, agricultural development tends to depend upon irrigation schemes. The way in which the rain falls

in heavy showers and storms has had the effect of denuding South Africa of much of its soil. Add to these disadvantages the danger of locusts and it is easy to understand why this is not a big agricultural area.

The main crop is maize (or mealies), which is grown chiefly in the maize "triangle" in Transvaal and the Orange Free State, and on

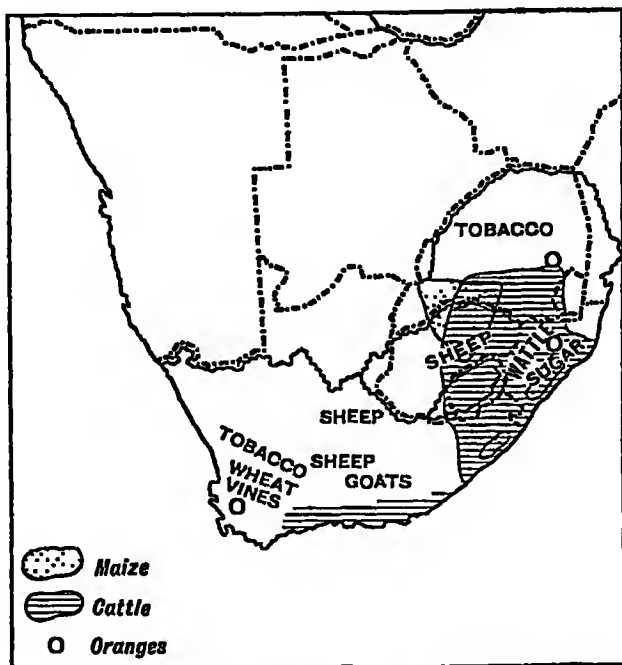


FIG. 38. FARMING PRODUCTIONS MAP OF SOUTH AFRICA.

Note the blank west.

the coastlands near East London and Durban. Note that these areas are on the eastern (*i.e.* the wetter) side of the land mass. Wheat, barley and oats are mainly found in the winter rain areas, where they are grown as winter crops and ripen in early summer. Sugar cane is grown in the hotter and wetter eastern coastlands. South Africa often has to import foodstuffs, but certain agricultural products are now becoming important articles of export. Tobacco, especially that used by the pipe-smoker, is grown mainly in the Transvaal, a region

which is also growing some cotton, though this is not a very important crop owing to the condition of the world markets in cotton. Probably the most familiar South African product is the oranges which, along with other citrous fruits, have become very important in recent years. They are grown in the area round Cape Town and also in Natal and Northern Transvaal, for it should be remembered that, though the orange is usually associated with "Mediterranean" areas, it is really a native of China (a tropical eastern margin area).

The Boers were mainly cattle farmers, and cattle are reared in large numbers, mainly in the wetter eastern parts of the veld. Maize growing and rapid transport are helping to develop a dairy industry, while wattle has been introduced to provide tanning material for leather. In the drier parts of the velds and on the Karroos sheep are reared, and there is a big export of wool. It was from South Africa that the merino sheep was taken to Australia—which country has now long surpassed it in the production of wool. The Karroos are also noted for the production of mohair from Angora goats.

Mining.—This has been the main source of South Africa's wealth, and it was minerals that first led to development. The labour in the mines is carried on by natives, who work on the "compound" system. Under this they sign on for definite periods, during which they live in compounds, where they are fed, housed and amused by the mining company, and which they are not allowed to leave. At the end of their contract they are paid, and are free to sign on again or return to their kraals. The reasons for this method can easily be understood.

The principal minerals which first attracted attention were gold and diamonds. Gold is found mainly in reefs in areas of old rocks, and as a result it has to be mined by big companies. Many of the mines are very deep. The chief producing area is along the Witwatersrand or "Rand" as it is generally called, the main mining centre being Johannesburg. This region produces about half of the world's supply of gold.

Diamonds were originally found in the Kimberley district, where

they were obtained from areas of volcanic blue clay. The mining now extends in a long stretch along the west of the Orange Free State in South-West Transvaal, where there is a big area of "alluvial diamonds". This type of diamond is also found in South-West

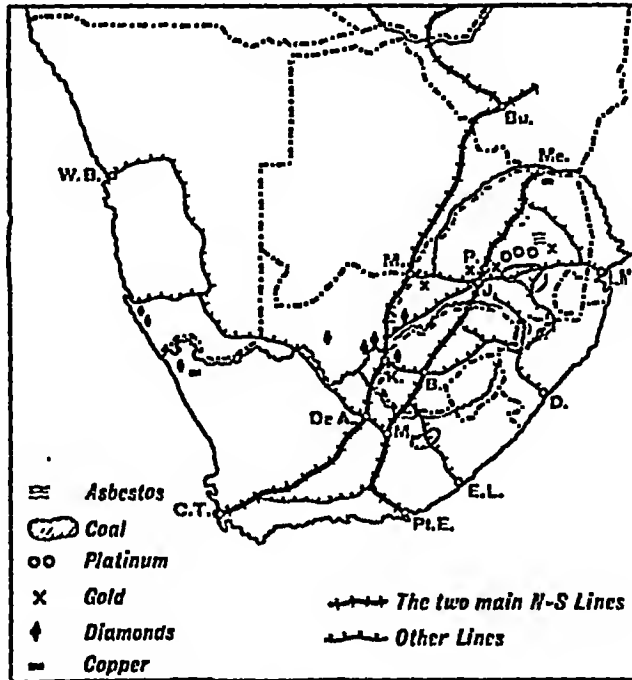


FIG. 39. RAILWAY AND MINERALS MAP OF SOUTH AFRICA.

Africa. In order to maintain prices the diamond industry is now very strictly controlled.

Less spectacular minerals are now playing their part in South Africa's development. *Coal* is very important. It is mined on the flanks of the Drakensberg Mountains. The main centres are *Middelberg* in Transvaal and *Newcastle* and *Vryheid* in Natal. From the last two the coal is exported from Durban to the coaling stations and the seaboard of the Indian Ocean. There is also a certain amount of coal near *East London*.

Copper is mined near *Ookiep*, and exported from *Port Nolloth* in

Cape Province, and there is also some in Northern Transvaal near *Messina*.

Asbestos is mined in North Transvaal and *platinum* near *Lydenburg* and *Pretoria*.

Owing to its European development, South Africa has developed far enough to have reached a manufacturing stage, though as yet this is not very far advanced, for the country mainly imports its manufactured goods in exchange for raw materials. The chief industries are connected with the preparation of leather, wool and fruit for export.

Towns and railways.—The main towns are either mining centres or ports. The chief mining centres have already been mentioned. The main ports are *Cape Town* and *Durban*.

Cape Town is a port of call and a railway terminus situated in the extreme south-west, so that it is also the centre of the fertile winter rain districts. It is the main port of South Africa and is the capital of Cape Province.

Durban is situated centrally in the coastlands of Natal, but it has mainly become important owing to its rail connections with the mining areas of the Transvaal and Orange Free State. Other ports are *East London* and *Port Elizabeth*.

It is interesting to note that the state capitals are not necessarily the chief cities. They are *Pietermaritzburg* for Natal, *Bloemfontein* for the Orange Free State and *Pretoria* for the Transvaal, the last also being the seat of the Union Government. Railways have been hampered by the steep rise to the plateau, which has necessitated a narrow 3 ft. 6 in. gauge. There are two main railway lines.

A study of the map shows that these run inland from the south and roughly parallel to one another. The line from Cape Town into the Rhodesias was British built and so lies west of the old Boer provinces. This is part of the suggested *Cape-Cairo route*. That from Port Elizabeth runs to Johannesburg and then northwards.

Durban has lines reaching the plateau and serving both Transvaal and the Orange Free State.

EXERCISES ON CHAPTER IX

1. Compare (*a*) the climatic features, (*b*) the occupations of the inhabitants, of Natal with those of the Gold Coast, and account for the differences. (C.S.C.)
2. What parts of British South Africa are important for (*a*) wine, (*b*) oranges, (*c*) tobacco, (*d*) wool? Under what conditions is each of these produced? (C.S.C.)
3. Describe the part played by mineral wealth in the opening up of South Africa.
4. What are the agricultural possibilities of South Africa?
5. Would it be worth while to proceed with the completion of the Cape to Cairo railway? Give reasons for your answers.

REVISION EXERCISES ON CHAPTERS VI-IX

1. What racial problems may be important in Africa in the next few generations?
2. Why were European powers so eager to obtain colonies in Africa?
3. Compare and contrast the two "Mediterranean" climate areas of Africa.
4. Locate four important African ports. Give the reasons that have led to their growth.
5. Draw a map showing (*a*) the proposed Cape to Cairo railway route, (*b*) the present air route to Cape Town, (*c*) possible west coast air route to Cape Town, (*d*) shipping routes.
6. Consider the commercial value of the African rivers.
7. In what region of Africa is irrigation important? What part does it play in the areas concerned?

CHAPTER X

AUSTRALIA

AUSTRALIA, which is the smallest of the continents, has already been mentioned briefly in discussing the relative positions and build of the southern continents.

Position.—Compare the positions of Africa and Australia again, and note particularly that, while Africa stretches from 35° N. to 35° S., the Australian mainland lies between 10° and 40° S., though Tasmania extends as far as 44° S.

The brief outlines of the build of the continent have already been mentioned, and three main divisions were noted. These must be considered in turn.

The Western Plateau.—This is the easternmost portion of Gondwanaland (see p. 54), and, consisting therefore of comparatively horizontal rock layers like the African plateau, presents a steep face to the coastal plains, which are narrow, though they are somewhat broader in the north-west, where heavier rainfall plays its part in sculpturing the land. The fault formations associated with Gondwanaland may again be noted. In the east Lake Torrens and Spencer's Gulf mark a rift valley. Further, east to west faults have led to areas of the plateau being thrust up to form mountain ranges such as the Musgrave and Macdonnell Ranges.

The Eastern Highlands.—A series of old highlands that have had a long history. Originally a fold area, they have been worn down till practically level, thrust up again, and are now in the process of being worn down again. They are nowhere very high, but the eastern slope is steep and, with the heavy rainfall on the coast helping to cut deep valleys into this old area, they have been a considerable hindrance to communication, and thus have earned the general name of the Great Dividing Range, although they are known

by a variety of names along their length, as may be seen from a fairly large scale atlas map. In the south-east the mountain barrier bends round and has an east to west direction. *Tasmania* is a detached portion of this region.

The Central Lowlands.—Made up of sedimentary rocks formed on the bed of an old sea, when the eastern highlands were much higher than they are now, the lowlands are not quite continuous from north to south for there is a low *watershed* across them rather to the north. This is made up of the *Barkly Plateau* and the *Selwyn* uplands. The drainage of the lowlands is interesting (see Fig. 40). North of the watershed the rivers drain to the *Gulf of Carpentaria*. South of it there are two main areas of drainage. One is a basin of inland drainage to *Lake Eyre*, which is often very nearly dry. The main drainage area of the Central Lowlands, however, is that of the *Murray-Darling river system*. Note how the *Grey Range* forms a divide between these last two drainage systems. Despite their rather imposing appearance on the map, the Murray and Darling are of little value for transport purposes, for reasons that will be easily appreciated after the climate of Australia has been considered. The *Flinders Range*, which is quite a notable feature of this area, represents an upthrust of old hard rocks.

The Great Barrier Reef forms an interesting feature in the physical map of Australia. It stretches halfway along the eastern coast of the continent, and is a coral reef which has been built up by the activities of the coral polyp, the reef actually being made of the remains of these organisms. The coral polyp can only live in warm, clear, shallow, salt water, and this explains why the reef skirts the coastlines, does not extend beyond the tropics, and has gaps opposite the mouths of rivers.

Climate

Study climatic maps of Australia, and revise its climatic areas from the chapter on world climatic regions.

Temperature.—As will be seen at once, no part of Australia at any time experiences a really cold climate. This is easily understood from its position. In winter (July) the south is comparatively cool,

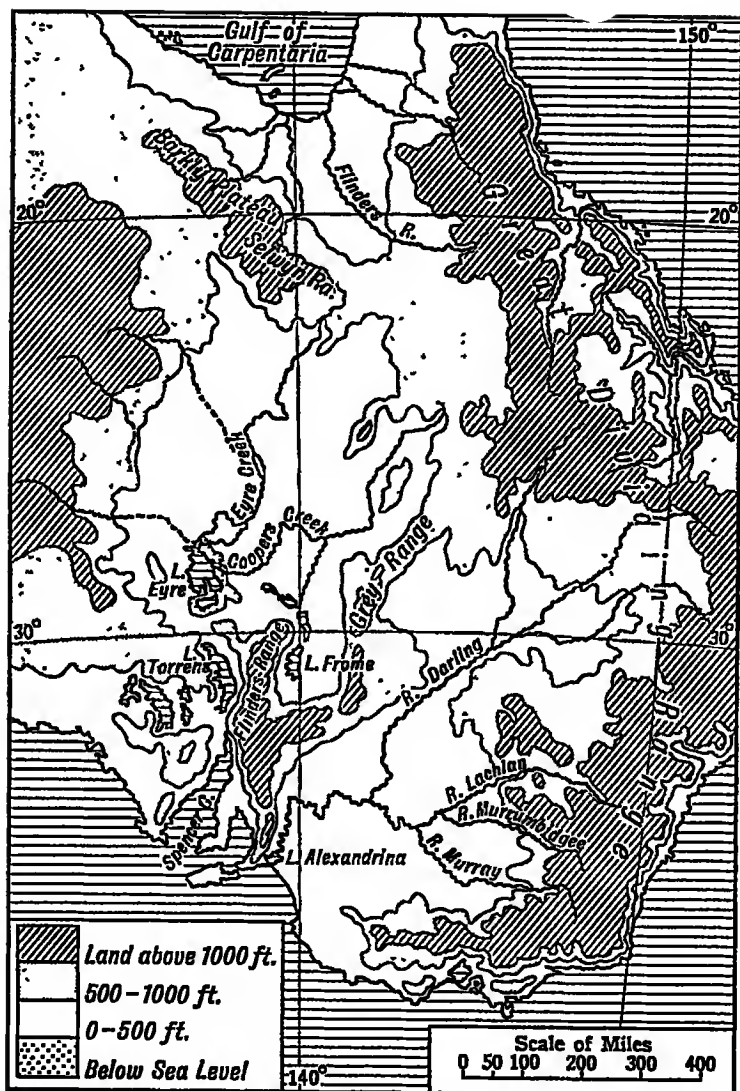


FIG. 40. THE DRAINAGE AREAS OF THE CENTRAL LOWLANDS OF AUSTRALIA.

Note the watersheds.

but the north is still hot. In summer (January) the northern interior gets very hot indeed. Both coasts are practically at the same temperatures, which shows there is no unequal influence from ocean currents as there was in Africa. Note the way in which the isotherms bend over the land—polewards in summer and equatorwards in winter. This shows the influence of the unequal heating of land and sea upon temperature.

Rainfall.—Since Australia lies mainly in the region of the South-East Trade winds, the configuration is bound to play a large part in the distribution of rainfall. As the main highlands are along the east, the Trade winds are only able to influence a rather narrow area along the east coast.

Mention has already been made of the intense heating of the northern interior in summer. This sets up a region of low pressure. The climatic controls of North Australia can be best understood if the world pressure and wind maps are referred to (Fig. 21). The difference in seasons between the two hemispheres must also be remembered. In the southern winter the South-East Trades are blowing strongly to the low pressure over Asia, which is setting up the monsoons, and so these winds bring little rain to Australia, save for some along the north-east coast. In the southern summer, however, the North-East Trades are blowing strongly from the intensified high pressures of the northern hemisphere, and are drawn into the low pressure over Northern Australia, and, having crossed the equator, come to it as the North-West Monsoon, bringing heavy rain to the north coast, while lighter rain extends a good way inland. At the same time, the South-East Trades swing in to the low pressure centre and so bring heavy rain to the north-east coast, while the whole of the east coast tends to receive its maximum rainfall at this season, but, as it is constantly under the South-East Trades, the east coast from the Tropic of Capricorn southwards has fairly regular rain. .

The South of Australia is also under seasonal influences, but here it is the normal swing of the wind belts, so that the south-west corner, and the region round about Spencer Gulf and the mouth of the Murray-Darling, have rain in winter from the westerlies, but are comparatively dry for the rest of the year. Tasmania is far enough

south to be in the belt of the regular westerlies and so has rain all the year, the rainfall naturally being heavier on the west than on the east.

Climatic areas of Australia.—From these facts it is possible to divide the continent into its main climatic regions. These are marked on the map (Fig. 41), while the numbers in brackets indicate the areas which should be looked up in the climatic regions of the world.

1. Tropical Eastern Margin Area (A 2).

2. Tropical Monsoon Area (A 4).

3. Hot Desert Area (A 5), though the edges of the area indicated really include considerable areas with a light but uncertain rainfall, giving rise rather to semi-desert conditions.

4. Warm Temperate Western Margin or Mediterranean (B 1).

5. Warm Temperate Eastern Margin (B 2a).

6. This represents a transition area between the regions already mentioned. Its eastern boundaries are fairly clearly marked by the eastern highlands, but its other edges are more difficult to demarcate. As a whole, it gets most of its rain in summer when pressures are low, but this rainfall is very unreliable and droughts are common.

7. Cool Temperate Western Margin (C 1).

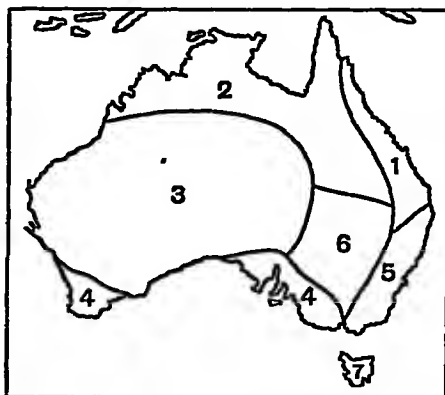


FIG. 41. CLIMATIC REGIONS OF AUSTRALIA.

Artesian Basins

Before considering the vegetation and development of Australia, it is necessary to consider an important feature of the continent. This is the large amount of land included in the Artesian Basins. These have been briefly noted in the Sahara, but they are so impor-

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tant in Australia that it is necessary to consider them in more detail. They are best understood by reference to Fig. 42, which shows a

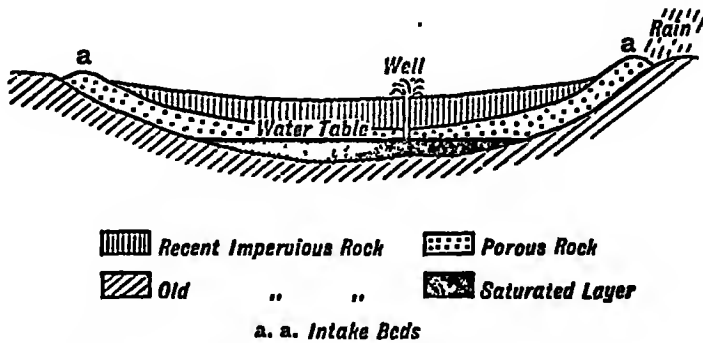


FIG. 42. SECTION OF A TYPICAL ARTESIAN BASIN.

section of a typical artesian basin. This shows that the rain, falling on the porous beds where they come to the surface (the *intake beds*), soaks into these beds, but, being unable to sink through the layer of impervious old rock, then flows down along the porous rock to the lowest point of that layer. Here it remains, for it cannot sink through the impervious bed rock, while the impervious younger layers above prevent loss by evaporation. If a well is sunk to reach the saturated layer the water usually comes to the surfaces under hydraulic pressure. The top of such a saturated layer is called a *water table*. It will be seen that, in this way, water can travel many miles underground from the rainy area, and so can be of great value



FIG. 43. ARTESIAN AREAS OF AUSTRALIA.

1. Great Australian Basin.
2. Murray River Basin.
3. Eucla Basin (salt).
4. Coast Plain Basin.
5. North-Western Basin.
6. Desert Basin.

in watering an otherwise dry area. The artesian basins of Australia are very important as they bring water to the dry interiors, where the rainfall is very uncertain. The chief artesian basins are shown on Fig. 43.

Vegetation, Animals and People

These present peculiar features which can only be understood if one important fact about Australia is borne in mind, namely, its early separation from the mainland of Asia. Most atlas maps will mark a line running through the East Indies, named "Wallace's Line", which runs south of the Philippines, through the Macassar Strait, and between Bali and Lombok. This line represents the main vegetation and animal "divide" between Asia and Australia, the various species being predominantly Asiatic to the west of the line, and predominantly Australian to the east of the line.

Vegetation.—Despite its size and variety of climates Australia has not a great variety of vegetation. The principal trees belong to the Eucalyptus or "gum tree" species. These resist drought by shedding their bark and not the leaves, which turn sideways in order to avoid the effects of the strong sun. The other main types belong to the acacia family, such as the wattle, which has already been noted as having been introduced into South Africa.

As may be expected from a rainfall map, the areas of forest are not particularly large, being found chiefly in the tropical north, along the east coasts, and in the south west. From the last named in particular come the two chief varieties of wood, Karri and Jarrah, both of them hard and resistant timbers exported for use for paving and flooring purposes. These, with other less important hardwoods, give Australia a valuable export trade in timber.

Away from the coastlands the forests soon give place to less luxuriant vegetation. Behind the northern forests are large areas of savanna, while in the drier areas there is either coarse grassland or scrub with stunted acacias of various types. Much of the native grassland has been replaced with European grasses more suitable for cattle.

The vegetation map should be compared with the map of the climatic regions and the rainfall maps.

Animals.—As a result of its early separation Australia has very few animals, and the chief native animals belong to the marsupial group—animals which carry their young in pouches. None is capable of domestication. It is often said that the birds are practically songless; but this is not correct, as Australia has such fine songsters as the song-thrush, magpie, lyre-bird and many others. European animals have been introduced and have flourished. This is particularly so in the case of the rabbit, which has multiplied to such an extent as to become a pest—a state of affairs mainly brought about by the absence of any animals or birds which preyed upon the rabbit.

People.—It will be seen that the native peoples (the aborigines) were not particularly blessed by nature in their opportunities, and it is little wonder that they were at a very primitive stage of development when Australia was discovered in the eighteenth century. They were, in fact, leading a stone age hunting existence, having no settled life and only the merest idea of the beginnings of agriculture. They were never many in number and their numbers have decreased since the white man came. The Tasmanian aborigines, an even more primitive type, have actually become extinct.

EXERCISES ON CHAPTER X

1. Compare Africa and Australia under the headings (a) build, (b) climatic areas.
2. What are the more important natural vegetation regions of Australia? How do you account for each of the regions you mention? (S.L.C.)
3. Compare and contrast the east and west coasts of Australia under the headings (a) physical features, (b) climate.
4. Explain carefully the distribution and seasonal occurrence of rainfall in Australia.
5. Draw a physical and climatic section of Australia along the Tropic of Capricorn.

CHAPTER XI

AUSTRALIA : PRODUCTIONS AND OCCUPATIONS

As might be expected, owing to its distance from Europe and to its apparent lack of resources, the early development of Australia was slow. Settlements first took place along the south-east coast area, and the slow spread inland is easily understood if the build of the continent is borne in mind. Although Australia developed as a series of separate States, it is now a Federal commonwealth and, since it is thus a unit, there is no need to treat it as a series of regions.

The real impetus to Australian development was given by the discovery of gold at Bathurst in 1851, and for that reason, in the case of Australia, mineral productions will be dealt with first.

Minerals.—As has been mentioned above, it was mineral wealth, particularly gold, that was the magnet which first drew people to Australia in any numbers. In recent years Australian mining has declined in importance, both actually and in comparison with other developments. Many of the old mining centres are now practically closed down. Nevertheless, minerals still occupy quite an important position in Australia's trade.

Gold is mined in practically every State. The original centre in New South Wales was Bathurst, and gold is still mined there and at Cobar. In Queensland most metal now comes from Gympie rather than the old centres of Charters Towers and Mt. Morgan (once described as a mountain of copper capped with gold). The old centres in Victoria, Ballarat, and Bendigo, still produce. West Australia now produces about 80 per cent. of Australia's gold (compare its geological formation with South Africa). The mining developed in the desert at Coolgardie and Kalgoorlie, and a railway and water pipe were built to serve them. There are many mining centres

working outcrops which run roughly from north-west to south-east, chief of these being East Coolgardie, Kalgoorlie, Murchison, Boulder, and Cue.

Silver is found chiefly at Broken Hill in New South Wales, where

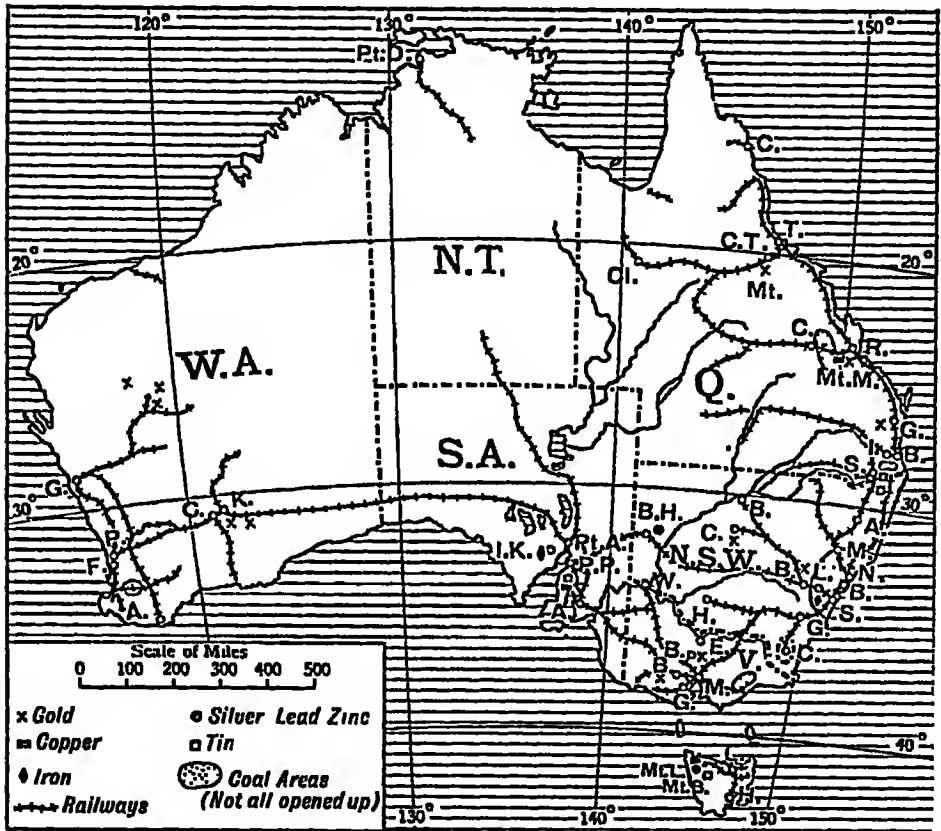


FIG. 44. CHIEF MINERAL AREAS AND RAILWAYS OF AUSTRALIA.

Identify the towns.

it is found in association with lead. There is also some production from Mt. Lyell in Tasmania.

Lead is mined at Broken Hill in sufficient quantity to make Australia the chief producer of lead in the British Empire. The ore is smelted at Port Pirie on Spencer Gulf. There is also some production at Mt. Lyell.

Zinc is found in association with silver and lead at Broken Hill and Mt. Lyell.

Copper, like gold, is declining in value. The original mining centres were Moonta and Wallaroo, in the Flinders Range, South Australia, but the chief mining centres are now Mount Morgan and Mount Lyell.

Tin is not particularly important and is rather scattered. The main centres are Mount Bischoff in Tasmania, the New England Plateau in the north of New South Wales, and Stanthorpe, Herberton and Cloncurry in Queensland.

Iron is not much mined, the chief centres being Iron Knob in South Australia and Lithgow in New South Wales.

Coal.—Though coal mining has been of relatively recent development in Australia, the coal produced now equals in value all the other minerals. The importance of Australia's coal is enhanced by the small amount of coal in the Southern Hemisphere, and by the additional fact that there are no very large supplies being worked in the areas immediately bordering the Pacific Ocean.

The main field lies on the eastern slopes of the Blue Mountains both north and south of Sydney. The chief centres are Newcastle on the Hunter river—along which is the main coal area—Maitland, Sydney Harbour, Bulli and Lithgow which, owing to its iron ore, has steel works.

Another field is situated in South Queensland, and is worked chiefly at Ipswich, while further north a field is being worked in the Dawson river valley and at Clermont. There is a small field round Collie in the south-west of West Australia. Victorian coal is mostly the younger brown coloured lignite. There are very extensive deposits of this in the east Gippsland area, and it is used for generating electricity for the more thickly peopled parts of the state.

Farming in Australia.—It was mineral wealth which first caused any big development in Australia, but it is farm products which now supply the greater portion of the country's wealth. Before considering the details of Australia's farming developments, a few general facts may be noted. Reference to climatic and vegetation details will show that large portions of Australia are little suited to

development. The main areas suitable are the south-eastern quarter and the "Mediterranean" areas. The centre is an area of aridity. The north is tropical and, generally speaking, tropical areas have not been regarded as suitable for white settlement, but are regions developed by coloured labour under white supervision. Australia, however, has refused to allow coloured labour to enter (a policy usually known as the "White Australia" policy), so that the

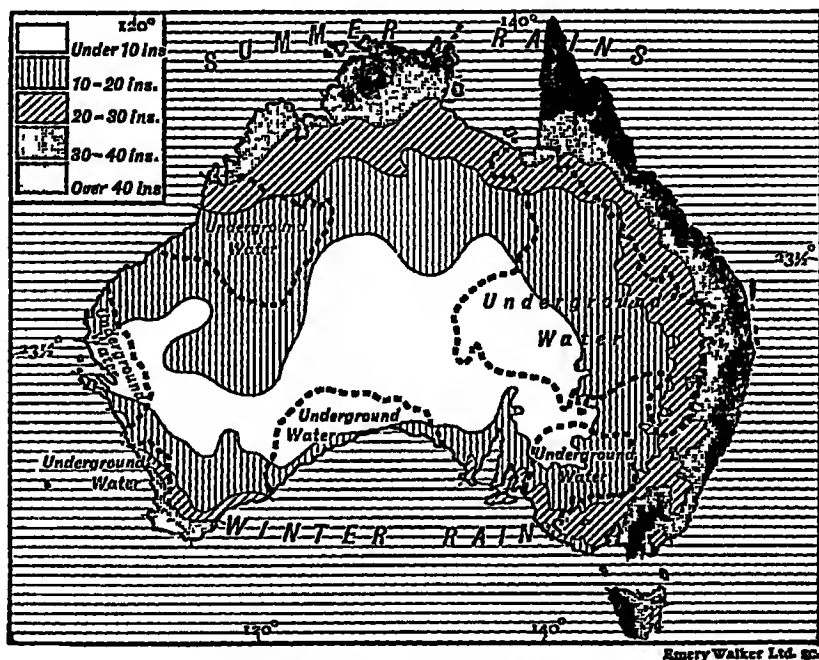


FIG. 45. AUSTRALIA—RAINFALL.

north has so far been opened up very little, though attention is now being turned in that direction. In discussing the areas suitable two points must also be remembered—the importance of the artesian areas, and the uncertainty of the rainfall in the areas lying west of the Dividing Range (mainly climatic region 6).

The two most important productions of Australia are wheat and wool, and a glance at the sketch map showing farming types will suggest a link between these two. Wheat does not thrive in a very

wet climate and is rarely grown inside the tropics. In the same way sheep are predominantly animals of the drier regions.

Wheat grows best with an annual rainfall of from 18 to 25 in., but it can be grown in areas with rainfall outside these figures. In Australia it is grown in regions having from 10 to 30 in. of rainfall, but the areas near the 10 in. isohyet do not produce much wheat. The chief wheat growing areas are in the fertile plains of the

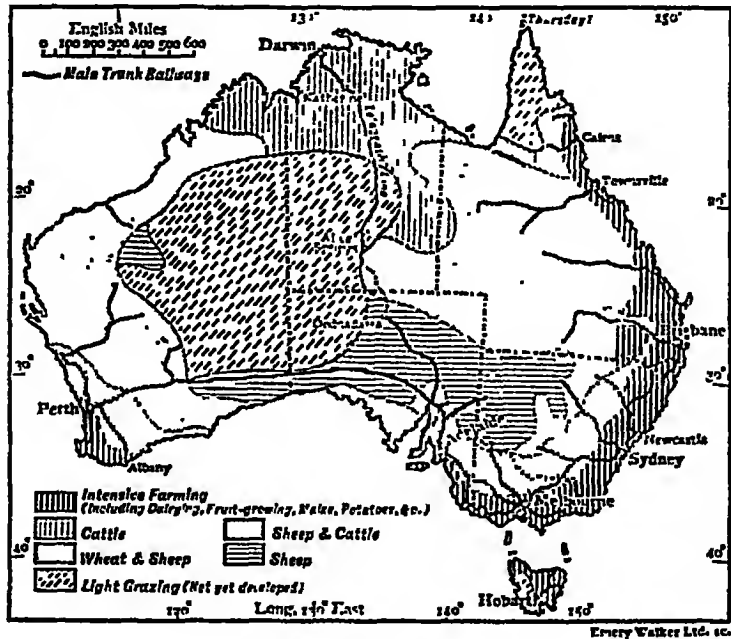


FIG. 46. AUSTRALIA—FARMING.

Murray basin—the *Riverina* plains—where irrigation is possible, and in the mediterranean areas. It is grown chiefly as a winter crop and is reaped in early summer. As this is December there is often a good market for Australian wheat. The greatest part of the Australian export goes to Great Britain, but some is also sent to China and Japan. The chief wheat exporting centre is Adelaide.

Sheep are the main source of Australia's wealth, its flock of about 100 millions representing a fifth of the world's sheep. The dry climate and the wide grasslands of the central area can be taken as one of the big reasons, another being the large developments that can take place in sheep rearing with the aid of only a few men—a very important point in the opening up of a new and remote region. Further, the rather poor grazing of the plains, salt bush, etc., was suitable for the sheep. Sheep are reared in the wheat area, but the drop in importance towards the 10 in. isohyet is not so marked as was the case with wheat. In the main wheat belt the farmers are both wheat-growers and sheep rearers—the land being thus rested from continual cropping, and the farmer being given two things to sell. Further west the chances of wheat growing well are not so good, but by increasing the acreage of grazing, sheep can still be reared, and so the drier areas, while rearing fewer animals, are yet more definitely sheep areas. The uncertainty of the rainfall has partially been overcome by boring artesian wells, and partly by improved transport, which enables sheep to be moved away from areas of drought. The sheep area extends into the tropics, especially into the big artesian area of Queensland.

The chief type of sheep reared is the long-wooled merino, for Australia rears sheep chiefly for wool production. The merino was introduced from South Africa, but the Australian climate has so suited it that the Australian merino now produces much finer wool than the South African type. Since the coming of refrigeration and rail transport the export of mutton has become possible, and in the more thickly peopled areas the merino sheep has been cross-bred with smaller English types, thus producing a variety which, while still yielding good wool, also produces good mutton.

The most important period for the sheep farmer is shearing time, and in Australia shearing is done chiefly by machinery, and starting in August in the hot north, continues till October in the cooler south. After shearing time the wool is sold at the big wool markets of Sydney, Melbourne and Geelong, buyers coming from all the big manufacturing countries of the northern hemisphere.

Besides these two main aspects, Australian farming development

covers a diversity of products, as might be expected from such a large area. These can be dealt with more briefly.

Apart from wheat, there is not a great deal of grain growing. In the cooler and wetter districts of south-eastern Victoria *oats* are grown, while in the more tropical coastlands of Queensland and northern New South Wales *maize* is grown, but not in sufficient quantities to supply Australia's needs, although there are large areas suitable for the growth of the crop.

Fruit is becoming more and more important. Apples, plums and peaches are grown in Tasmania, in the Riverina area and Victoria, and in Western Australia. Citrus fruits, particularly oranges, are grown in New South Wales, principally round Parramatta, round Mildura in Victoria, and in South Australia. In considering the fruit trade of Australia remember that the fruit will come on to the European market when northern hemisphere fruits are not available.

Grapes are grown on the slopes of the Lofty Range in South Australia, and in the irrigated areas of the Riverina districts, particularly in the region of the Murrumbidgee river. This grape growing leads to an export of wine and of raisins.

Pineapples are grown in the tropical coastlands of Queensland, and in this area, too, are important sugar cane plantations which, in addition to providing Australia with a valuable export, are also interesting as being the only ones in the world worked by white labour.

Cattle are reared in the wetter regions. On the savanna lands of the north, the cattle are reared chiefly for beef purposes, but in the cooler and more accessible eastern coastlands they are chiefly dairy cattle. The main dairy farming area is in the south-east, in the Gippsland district of Victoria. This is the area mentioned as the region where electricity is generated from the lignite deposits, and this electricity is valuable in driving the milking and butter-making machinery of a dairying region.

The rainfall map (Fig. 45) and the farming map (Fig. 46) should be studied in comparison with the above account of the farming areas of Australia.

EXERCISES ON CHAPTER XI

1. What are the geographical and economical difficulties confronting Australian producers of (a) Sugar in Queensland, (b) Fruit in Riverina, (c) Minerals at Broken Hill? (C.S.C.)
2. Discuss the relationship between climate and occupation as evidenced in Australia.
3. Write an explanatory account of the different types of pastoral occupations to be met with in Australia.
4. Why is irrigation necessary in many parts of Australia? Which parts of the continent make use of irrigation?
5. Where are the main wheat-growing areas of Australia? Why are they so situated, and what facts lead to Australia using the "combined harvester" reaping and threshing machine?
6. Discuss the present development and future possibilities of Australia north of the Tropic of Capricorn.

CHAPTER XII

AUSTRALIA: STATES AND DEVELOPMENT

AUSTRALIA has been treated as a whole since it is now a unit of the British Empire. It must be remembered, however, that it grew up as a series of colonies scattered around its more habitable coastlands. Later on these colonies came in contact and state boundaries were set up—usually quite artificially drawn and paying no attention to natural regions. The early development of these colonies was round the original settlements and from them gradually spread outwards. There is one very marked feature of Australian development. Although it relies primarily on farming and mining for its prosperity and trade, the population has yet tended to concentrate into a few large towns. Although the rather small population does not offer a very big market for local industries, attempts to foster these have been pursued, mainly with the aid of high tariffs, and this has had a

very big effect on recent Australian history and politics. Apart from lack of population, other conditions have been unfavourable to general development. The separate States were each much concerned with asserting their own independence, and one of the results of this was the building of railways of different gauges in the different States. There is no need to consider the separate States in any great detail, but the following brief summary should be studied with reference to the general account of productions already given, and

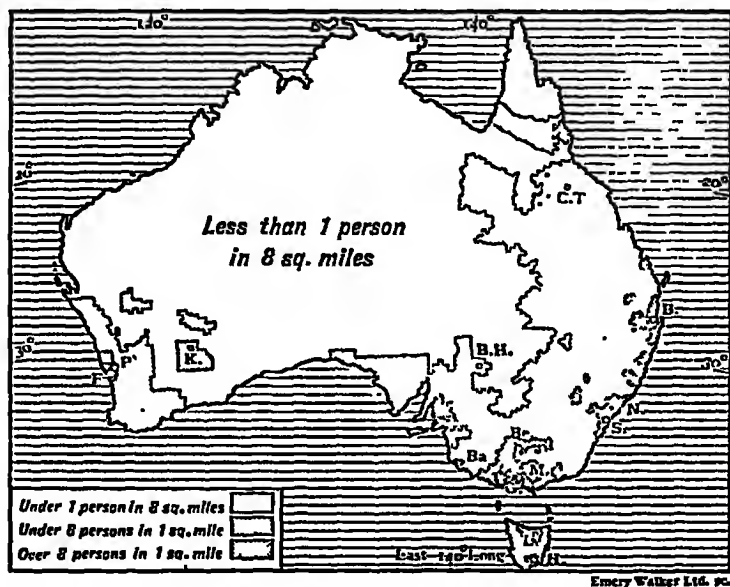


FIG. 47. AUSTRALIA—POPULATION.

also with the aid of atlas maps showing the boundaries of the States and the map showing the distribution of the population (Fig 47). In connection with the last map notice the way in which population is confined to the coastal areas and lies almost entirely outside the tropics.

Queensland.—Lying in the north-east, this large State is mainly tropical. The chief developments have taken place in the river valleys along the coastlands. Behind these coastlands are the Great

Dividing Range and the interior lowlands, which form a cattle and sheep rearing area in the great artesian basin. The chief town is Brisbane, in the more temperate south of the State. It is situated on the Brisbane river, which gives it a good harbour. Railways (of a narrow 3 ft. 6 in. gauge) run inland and along the coasts. Communication along the coast is not very easy, and as a result smaller ports in Townsville, Rockhampton and Cairns, each with railways running inland to mining and ranching areas, share the trade of the State with the capital, and so Brisbane does not dominate its State as much as is the case with the other State capitals.

New South Wales.—This is the oldest and still, probably, the most important State. Here again are coastal lowlands, highlands, and interior plains. The coastal lowlands are fertile and well developed, and are further helped by the coalfields. The western parts of the highlands are plateau areas, important as grazing or farming areas. The plains are given over first to wheat and sheep, and then, further west, to sheep alone. In the south is the Murray basin with its fertile Riverina plains, which are being developed with the aid of irrigation.

Sydney, the main city, has a magnificent situation on Port Jackson. Railways (of the "standard" 4 ft. 8½ in. gauge) cross the Blue Mountains, by a not very easy route, and link up with the interior plains, while other lines serve the mining and farming districts along the coast. Apart from the mining centres, which have already been mentioned, the other towns of the State worthy of mention are a few small agricultural or stock rearing centres. The chief of these are Bourke on the Darling river, Hay and Wentworth in the Riverina area, Goulburn in one of the few convenient gaps in the Dividing Range, and Armidale in the New England Plateau, on the railway from Sydney to Brisbane.

Victoria.—Victoria is a small but thickly peopled State. In it the Eastern Highlands bend and run east and west, and in the south, between them and the smaller Otway and Gippsland Highlands, lies the Great Victorian Valley with the drowned lowland portion of Port Philip in the centre. The east of the valley is the dairying region, the west is a sheep area. Behind the Highlands lie

the Murray plains, the most important parts of which are developing with irrigation.

Melbourne, the capital, is situated at the head of Port Philip on the Yarra river. It has railways (of the "broad" 5 ft. 3 in. gauge) east and west along the valley, and north, through an easy gap,

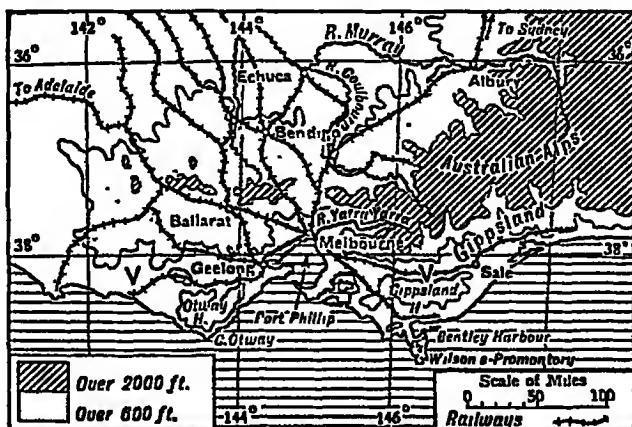


FIG. 48. THE GREAT VICTORIAN VALLEY (MARKED V V).

Note the influence of relief on railway building, and the many lines serving the fertile Murray plains.

into the Murray plains. Apart from the mining centres and Geelong, a wool port, other towns are Mildura, a fruit growing centre, and Echuca, both in the irrigation regions.

South Australia.—Here there is no Great Dividing Range, but a good deal of the State consists of the arid or semi-arid interior lands, and the most important part lies in the south. The lower basin of the Murray is being developed by irrigation, but the most important part of the State is the mediterranean area lying on the western slopes of the Lofty Range, and in the south of the rift valley noted in Chapter X. This is the area of fruit and wheat farming. Adelaide, the capital, is situated on the Torrens river, and is a considerable wheat port—the actual port is now Port Adelaide. From Port Pirie runs the Commonwealth transcontinental railway (4 ft. 8½ in. gauge) to Kalgoorlie, though other South Australian railways

are either broad or narrow gauge. Port Augusta at the head of Spencer's Gulf, is quite an important wheat port.

West Australia.—Although it occupies a large area, much of this State is of little value. The chief area is the mediterranean region in the south. Here rainfall gives rise to three belts—a coastal area of forests and dairying, behind which is a wheat belt, while further inland still is a sheep-rearing area, beyond which is the desert, important for its mines. The north-west coast is tropical and is beginning to be developed as a sheep and cattle rearing area.

Perth, the capital, is situated a few miles up the Swan river, at the mouth of which is Fremantle, the main port, and the western terminus of a railway linking up with the transcontinental railway. In addition to this railway to the Kalgoorlie area, Perth has railways north to Geraldton, the port for the Murchison gold area, and south to Albany, which serves the dairying and wheat areas. Most of West Australia's railways are of narrow gauge.

Northern territory.—This is administered by the Commonwealth government. The population is very small, but it is hoped to open up the savannas of the interior with the aid of the railway inland from Darwin, the only settlement of any size. The development of this area is a matter of future importance, especially if the "White Australia" policy is to be justified.

Tasmania.—The island State has a climate similar to Devon and Cornwall, to which it is often likened also because of its ruggedness, its tin mines and its fruit. Mining occurs mainly in the west, oats are grown in the north, while the main fruit area lies in the south. The population is mainly in the drier and less rugged east. In the south is the capital Hobart, on the Derwent, while the chief town in the north is Launceston on the Tamar (note the west country names).

Canberra.—When the States were united into the Commonwealth, the question of which town was to be capital arose, a question which was liable to arouse jealousies among the State capitals, and particularly between Sydney and Melbourne. The knotty problem was solved by building an entirely new town in a district of its own. This is Canberra, situated in a lovely valley in the Eastern Highlands in the south of New South Wales.

EXERCISES ON CHAPTER XII

1. How do you explain the fact that all the large towns of Australia are situated on or near the coast? (S.L.C.)
2. Describe and explain the distribution of population in (a) West Australia, (b) North Australia and Queensland. Relate your answer to the "White Australia" policy. (C.S.C.)
3. Explain why the greater part of Australia's population is concentrated in the south-eastern quarter of the continent.
4. Draw sketch maps to show the position of the following towns: Sydney, Brisbane, Perth. Bring out clearly the facts that have led to their growth.
5. Draw a map showing the Imperial Airways route to Australia.
6. Draw sections inland from Wilson's Promontory (Fig. 48), Sydney and Brisbane.
7. Is Australia likely to develop into an important manufacturing country? Give reasons for your answer.
8. Describe the principal features of (a) the relief, (b) the climate, (c) the occupations, of S.E. Australia and of the southern part of the Union of South Africa, pointing out any similarities and differences between the areas in these respects. (C.W.B.S.C.)

CHAPTER XIII

NEW ZEALAND

Position.—Lying some twelve hundred miles east of Australia is the island group forming the Dominion of New Zealand. It consists of the two main islands, *North* and *South Islands*, separated by *Cook Strait*, and the smaller *Stewart Island* lying to the south of South Island, from which it is separated by *Foveaux Strait*. The islands extend roughly from latitudes 35° to 47° S., which means they stretch a bit further south than Tasmania.

Build.—The outstanding feature in any physical map of the islands is the mountain chain which seems to form their backbone, but actually the structure is not quite so simple as this. The main mountains do indeed stretch from South to North Island. The *Southern Alps* of South Island are a young, folded system which stretch from near Cascade Point, mainly along the west coast, but becoming more central in the north of that island. In North Island they continue, as a series of rather lower ranges, along the east coast of the island, finally terminating in the promontory of East Cape. The main folds of these mountains run from south-west to north-east. In the south of South Island is a dissected plateau, made up of the worn down remnants of a much older system, in which the main folds ran from north-west to south-east. The western coast of this area has been considerably broken up by rifting and ice action to form the long narrow inlets which are known in New Zealand as “sounds”, but which are more generally known as fjords. The best known is Milford Sound. The long narrow Auckland Peninsula of North Island is also a remnant of this old system.

In the north of North Island, where the recent folds have led to disturbance of the crust, is a volcanic area surrounding Lake Taupo, where there are many signs of volcanic activity, such as geysers and

hot springs. This is also an earthquake area, as was shown by the great earthquake at Hawke's Bay in 1931. Mt. Egmont, in the west of North Island, is a very fine example of a conical volcanic peak. The

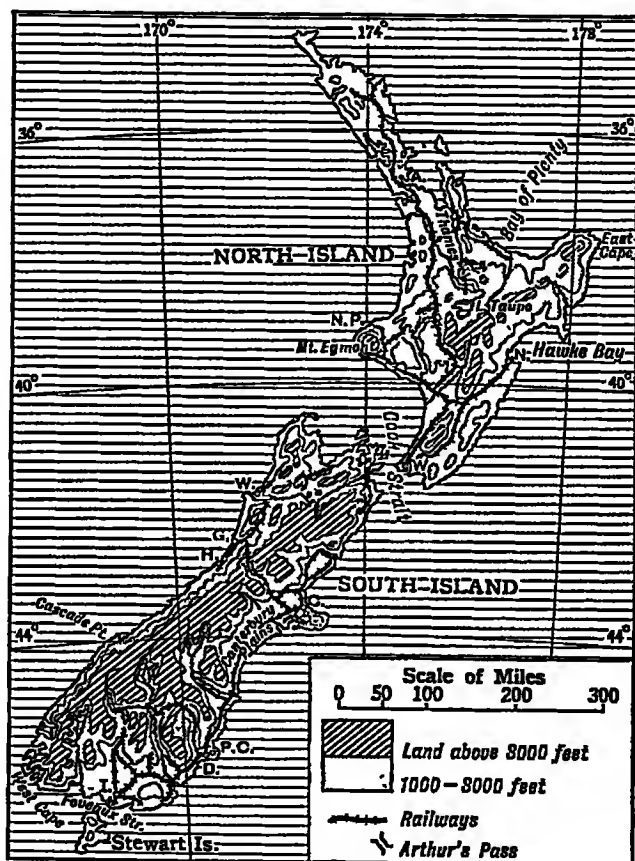


FIG. 49. NEW ZEALAND.

Identify the towns marked.

main lowlands of New Zealand are alluvial, having been built up by the rivers flowing from the mountain range. The chief plain areas are the Canterbury plains on the east of South Island, and the plains along the shores of Cook Strait in the south of North Island.

Climate.—Owing to its island position we should expect New Zealand to have a mild oceanic type of climate. This is particularly noticeable in its temperatures. North Island is mainly in the warm temperate zone, while South Island is cool temperate, but both have a very small range of temperature, the temperatures decreasing from north to south.

The rainfall comes mainly from the westerlies. South Island is a typical western margin cool temperate area (C 1), but the relief causes the rainfall to be unevenly distributed. Thus the west coast has over 100 inches per year, but the east coast under 35. Owing to the height of the Southern Alps much of the winter precipitation is in the form of snow and South Island, with its glaciers and snowfields, is noted for winter sports. North Island lies in the latitudes of the mediterranean areas (B 1), but since it is an island it does not have droughty summers, for in the north it receives Trade winds in that season. It does, however, tend to have a winter maximum of rain. As the mountains are chiefly on the east coast the rainfall in North Island is much more evenly distributed. This difference in distribution will be understood by referring back to Fig. 18.

Vegetation, etc.—Owing to its mild wet climate much of New Zealand is, or has been, forested. The biggest forest areas are naturally on the wet western slopes of South Island. The main tree was the kauri pine, but the red and white pine have now surpassed it in importance. In areas once covered with kauri pine forests, fossilized kauri gum is now dug up. Besides the trees there are giant ferns and tree ferns, while in the drier areas there are coarse tussocky grasses. In the wetter parts of North Island is found phormium, a fibre plant known commonly as New Zealand flax.

New Zealand does not possess a very rich animal or bird life; some birds, having no animal enemies, were wingless and tailless—a fatal defect when European domestic animals were introduced.

People.—Unlike the primitive Australians, the native people—the Maoris—were a strong virile race, who had come to New Zealand from the Pacific islands. After several fierce wars they have finally accepted the new state of things and take a normal part in New Zealand life.

Occupations and productions.—Although New Zealand has an area nearly as great as the British Isles, it has a population of only about one and two-thirds million people. Even allowing for the large mountain tracts, this yet means that the people are thinly spread over the area and, as might be expected, depend chiefly on farming.

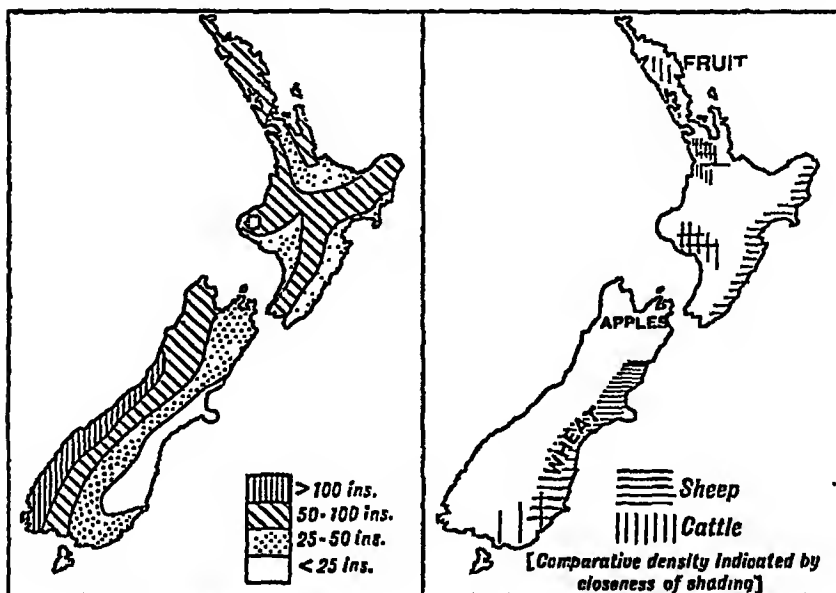


FIG. 50. NEW ZEALAND—
ANNUAL RAINFALL.

This map should be compared with the map of the physical features (Fig. 49).

FIG. 51. NEW ZEALAND—
PRODUCTS.

Compare this with the rainfall map (Fig. 50). Note the blank western portion of South Island.

and more particularly on pastoral farming, since that requires less labour than general agriculture compared with the area opened up.

Much of New Zealand's pastoral development, however, has resulted from the development of refrigeration. The first cargo of frozen mutton left the country in 1882, and since then it has become one of the chief meat supplying countries of the world.

As in Australia the chief occupation is sheep rearing, but the greater accessibility of the grasslands and the damper climate have led to a

difference. The sheep reared are mainly of the smaller varieties, which produce both good wool and good mutton, a special breed being the Corriedale, a New Zealand type developed from Merinos and the English Romney and Lincoln types.

The coarser native grasses have largely been replaced by better European types. Sheep rearing is carried on chiefly on the Canterbury plains and on the drier eastern plains of North Island. New Zealand thus has a large export of wool and frozen mutton—the best known of the latter being the famous "Canterbury Lamb".

Cattle are also reared in large numbers, chiefly in the milder and wetter plains of North Island. In addition to providing large quantities of frozen meat for export, this cattle rearing has led to a large export of dairy produce, which has in recent years tended to be New Zealand's main export. The rise of this dairying industry has been considerably helped by the government, which has always insisted on a high standard being maintained by the New Zealand exporters. The main butter area is in the north of North Island, while cheese comes from the south of that island, and from Otago province in the south of South Island.

New Zealand agriculture is mainly concerned with supplying its own needs for food, and providing food for the dairy cattle.

Wheat is grown mainly in the drier Canterbury plains, while in the cooler Otago area oats is the main crop. Some maize is grown round the Bay of Plenty in North Island.

One important development is fruit growing, which takes place in the north of North Island and in the Auckland area. The main fruits are apples and plums, but peaches are grown in the Auckland peninsula.

Mining.—Mineral wealth is considerable, but only the coal area of South Island is at all developed. This is situated along the north-west coast of that island, the main centres being Greymouth, Westport and Hokitika. Gold is found in various areas, but the chief mining centre is round Greymouth, and in the Thames valley in the north of North Island. Iron mining is being developed in Nelson province, in the north of South Island.

Owing to her many mountains and heavy rainfall, New Zealand

has a plentiful supply of water power which can be used to generate electricity. This can be used in the factories which are necessary for preparing her foodstuffs and wool for export.

Towns and railways.—The New Zealand population has not tended to concentrate into towns, so that there are only a few that need be noted.

Wellington, the capital, is situated on Port Nicholson overlooking Cook Strait, and it is thus centrally placed for the whole dominion.

Auckland, situated between Manukau harbour on the west and Waitemata on the east, is the largest town and main port. The harbour used by shipping is Waitemata. It is its northern position, near the main world routes, that makes Auckland the main shipping centre. The main railways of North Island consist of the lines running north from Wellington. One line goes east of the range to Napier on Hawke Bay, another west of the range across the plains to Auckland, with a branch to New Plymouth near Mt. Egmont.

In South Island the main towns are Christchurch and Dunedin. Christchurch is the main centre for the Canterbury plains, its port being Port Lyttelton.

Dunedin is the centre for Otago province, its port being Port Chalmers on Otago harbour.

In the extreme south is Invercargill, the main centre for the province of Southland. The main railway system of South Island runs from the north of Canterbury plains along the east coast to Invercargill, while from Christchurch a line crosses the South Alps via the Otira tunnel to reach the coalmining area of the west coast.

EXERCISES ON CHAPTER XIII

1. Show how the South Island of New Zealand differs from North Island in (a) surface features, (b) climate, (c) resources. (C.S.C.)
2. Both Australia and New Zealand rear large numbers of sheep. Discuss the dissimilarities in their sheep rearing industries.
3. Compare New Zealand with the British Isles.
4. What important effects have the distinctive features of its position and build had upon the development of New Zealand?

CHAPTER XIV

SOUTH AMERICA

Position and build.—The essential features of the position and build of South America have already been noted, more especially as they compare with the two southern continents already dealt with. The essential points concerning position are that South America, stretching from about 12° N. to 55° S., lies mainly south of the equator and extends considerably further south than either Africa or Australia.

Reference has already been made to such general outlines of the build of South America as may be noted from the map. These are a marked highland system in the west, two detached highland areas in the east and a more or less continuous belt of lowlands between these two highland areas.

The eastern highlands.—These form the western limit of the old Gondwanaland plateau (see p. 54), and thus are made up of old rocks which have not to any extent been folded, but are mainly faulted and tilted. There are two distinct "massifs", separated by the Amazon.

In the north is the lesser *Guiana Highland* area. This is not very well known, but as can be seen from a map, its steepest face is to the south, and it drains mainly to the Orinoco basin or direct to the North Atlantic Ocean.

The Brazilian Highlands in the south are a large and important highland region. They present a steep slope to the Atlantic and tilt gradually inland. As a result they drain mostly to the Amazon basin. Only one river of any size—the *São Francisco*—drains direct to the sea, and that has rapids where it leaves the edge of the plateau. It should be noticed that the main lines of drainage are from south to north—except in the south where the drainage is

southward and westward to the Parana—and that this means that the river valleys and their dividing watersheds are thus at right angles with any routes attempting to go directly inland from the Atlantic seaboard.

The Andes—This enormous series of ranges is by far the most outstanding feature in a physical map of South America. They consist of a series of long ranges or Cordilleras running from north to south of the continent close to the west coast. The actual distribution of the ranges is shown in a large scale atlas, and perhaps is more easily followed by working from south to north. In the south there is only one range—the Cordillera de los Andes—which, while comparatively low in the south (about 5,000 ft.), gets steadily higher as it goes northward, culminating with the giant volcanic peak Mt. Aconcagua (nearly 23,000 ft.) at 32° S. Just south of the tropic the single range divides into two and from here to 15° S. the two ranges—Cordillera Occidental and Cordillera Real—enclose the high plateau or altiplano of Bolivia, which is interesting as being a region of inland drainage mainly to Lake Titicaca, the big lake in the north. The altiplano is from 12,000 ft. to 15,000 ft. high. North of this there is one continuous chain with a series of *knots* from which other ranges branch off. These are shown on the sketch map (Fig. 52) and should be learnt from there. It will be noted that up to the equator the main chain is to the west, while the Cordillera Occidental and the broken chains on the east contain the headstreams of the Amazon drainage. North of the knot of Pasto the main chain crosses to the east, and the chains to the west are drained by the north flowing Cauca-Magdalena river system. The main chain then swings eastwards and leaves the mainland through Trinidad. It will be seen that this chain forms a real barrier from about 10° N. to 50° S., and in fact there is only one really practicable pass, the Uspallata Pass just south of Mt. Aconcagua.

The Andes are of comparatively recent folding, and so they are an area of volcanic and earthquake activity. The volcanoes, either active, dormant or in some cases extinct, are important features of the Andes. Some of the biggest of them have been marked.

The island studded and broken coastline in the south of the west

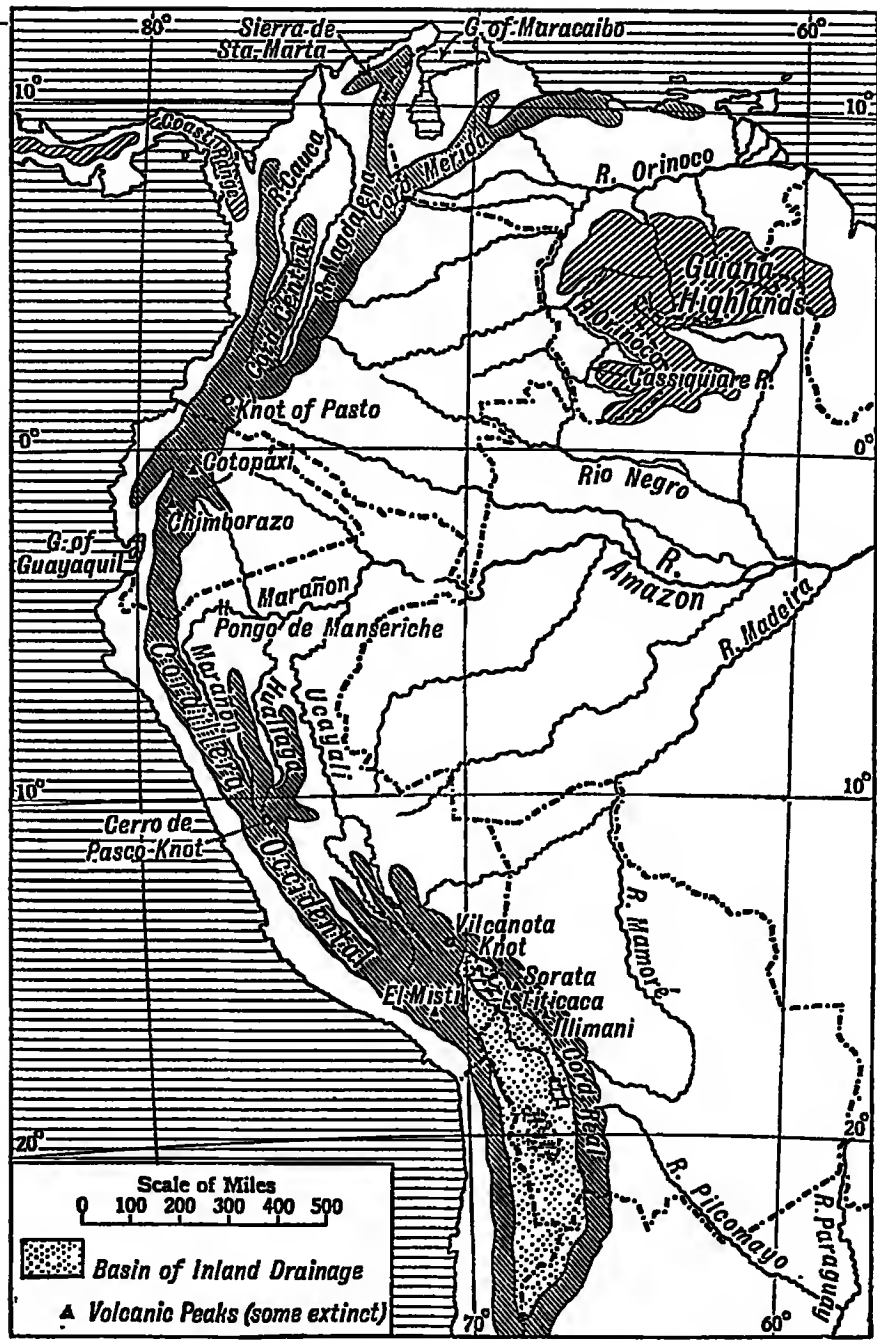


FIG. 52. THE MAIN CORDILLERAS OF THE NORTHERN ANDES.
(No attempt to indicate heights.)

(No attempt to indicate heights.)

Note—(i) drainage regions of the eastern slopes and of the Bolivian plateau.
(ii) the boundaries of the "Andean States" (see Ch. XVIII).

(ii) the boundaries of the " Andean States " (see Ch. XVIII).

coast is connected with a coastal range lying between the Andes and the Pacific, and will be dealt with in more detail later.

The Orinoco lowlands.—These lie between the Andes and the Guiana Highlands. The Orinoco is hampered by a delta at its mouth, but it is navigable by river craft as far as the Atures Rapids, just above the confluence of the Mela River, which drains from the eastern Andes. The Orinoco lowlands contain patches of rather stony and infertile soil, which naturally affect their development.

The Amazon lowlands.—Occupying a large area in the centre of the continent these have been built up of deposits brought down by the many rivers. The great length of the river is apparent from the map, and it will be seen that for the greater part of its length it is flowing over a lowland less than 500 ft. above sea level, which means that it only falls about two to three inches per mile. Because of this, and because of heavy rainfall, much of the land along the banks of the river and its tributaries is flooded in the wet seasons of the year. This "floodable" area is known as *Varzea*, while the land above flood level is known as *Terra Firmé*.

The river itself carries an enormous amount of water to the sea—so great an amount that the silt is carried too far out to form a true delta, and the fresh water does not mingle properly with the sea water for nearly two hundred miles out. For many miles from its mouth it is as broad as an arm of the sea, and it is navigable by ocean liners as far as Manaos, and by ocean-going steamers as far as Iquitos, while the actual head of navigation is the Pongo (or gorge) of Manseriche, where the river leaves the Andes (see Fig. 52). The main tributaries are the Negro from the north and the Tapajos and the Madeira from the south, while the Tocantins, which drains the Brazilian Highlands, joins the Amazon at its mouth, to the south of the big island of Marajo.

The southern lowlands.—These are drained by the Parana-Paraguay systems, which combine with the Uruguay to form the La Plata estuary. The main stream of the Parana drains the south of the Brazilian Highlands, leaving them by many falls, the most famous being the Iguassu falls on a tributary of that name. The Uruguay also drains this same highland area.

the numbers referring to the climatic areas as marked on the map of South America (Fig. 53) and those in brackets to the world climatic region.

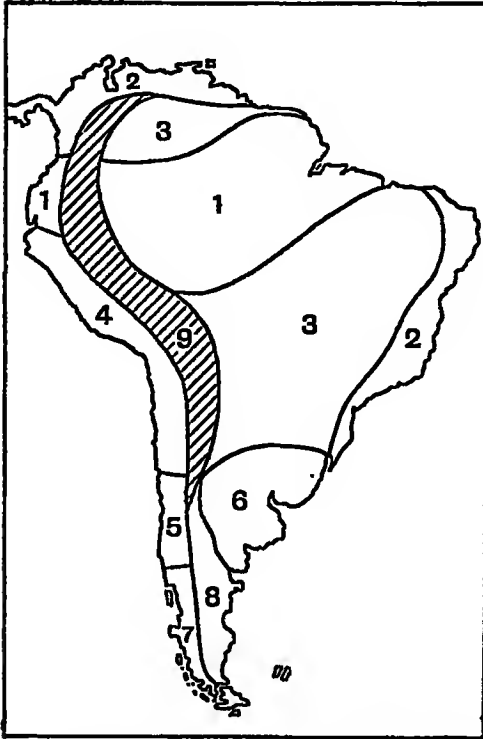


FIG. 53. CLIMATIC REGIONS OF SOUTH AMERICA.

1. Equatorial Area (A 1).
2. Tropical Eastern Margin Area (A 2). Note that this extends round the northern area of the continent owing to its shape at that particular latitude.

3. Tropical Interior Type (A 3).

4. Hot Desert (A 5).

5. Warm Temperate Western Margin (B 1).

6. Warm Temperate Eastern Margin (B 2a).

7. Cool Temperate Western Margin (C 1).

8. Cool Temperate Eastern Margin (C 3c). Notice how this area extends northward in between 5 and 6. This is brought about by the position of the Andes.

9. Mountain Area (F).

Vegetation, Animals and People

Since South America can be mainly described as a continent with a sufficiency of rainfall, the vegetation is naturally much richer and more varied than that of Australia and at least as rich as that of Africa. Since the continent extends into more temperate zones, new types of vegetation can be expected, while the mountain area of the Andes also has important effects on vegetation. The marked similarity of the climatic regions map and a map showing vegetation should be noted.

The equatorial and tropical forests.—The central portion of the Amazon basin is covered with a typical equatorial forest known as the Selvas. The low-lying Varzea areas are particularly swampy and impassable save by the natural routes of the waterways themselves. The limits of the forest lands extend southward in a series of tongues along the valleys of the tributaries. Naturally such a region has the same abundance of bird and insect life that was found in the Congo area, and it is these forests that are the home of the brilliantly coloured butterflies and the tiny humming birds. Animals are scarce save for the arboreal species. Among them may be noted the sloth and the ant-eater, which are able to move about hanging downwards from the branches of the trees.

The natives of the region are uncivilized, though not so uncivilized as the pygmies, and many are very hostile. This is the home of the blowpipe and its terrible poison darts. Some of the tribes are interesting as living communally in large tribal huts. The main groups live along the tributary streams and on the "terra-firme". A certain amount of simple cultivation of yams and manioc is carried on.

White influence has led to some development of the area, and this will be considered later. The tropical coastlands also have thick forest areas, though they are not quite so dense and impenetrable as those of the Amazon. Owing to their greater accessibility these coastal forest areas have been much more developed.

The temperate forests.—These are found in cool temperate western margin area in the westward slopes of the southern Andes. The trees are either deciduous or coniferous, the most valuable belonging to the latter type. The area is not very big and as yet is not of great importance, but it may some day be a valuable source of supply of timber. There are very few inhabitants, and these live by fishing and by gathering berries and edible roots.

The evergreen forests of central Chile.—This is one of the most favourable areas for human settlement, for the fertile lands of this area were covered with valuable trees of the temperate evergreen type. It is here that were found one of the strong races of South America, and practically the only native race to offer any serious

opposition to the invading Europeans. These people—the Araucanians—still live in the south of the area, and to a certain extent mingle with the white population, but generally live their own life in the areas reserved for them.

The tropical grasslands.—These lie both north and south of the equatorial forest areas and coincide with the regions of tropical interior type of climate.

In the north is the region lying in the basin of the Orinoco, and these grasslands are known as the Llanos. As has been said, some of the soil here is not very fertile, so that there is not a great deal of tree growth. These grasslands are rather scorched and useless in the dry season, and for this reason there were few native tribes, while in modern times development has been slow.

In the south is the area occupying the Brazilian Highlands and the upper portions of the Parana-Paraguay basin. The grasslands of the Brazilian Highlands are known as the Campos. The physical features of this area have been mentioned and it will be noted that these make access to these regions difficult. There is a good deal of tree growth, especially in the wetter slopes, and in the more temperate southern portions are areas which yield valuable supplies of timber. In the north-east an area of low rainfall and poor soil has led to a patchy thorn forest and scrub known as the caatinga.

The Parana-Paraguay areas are more level. The regions near the rivers are wet enough for a considerable amount of tree growth, and in the areas round the Paraguay and its tributaries is the region known as the Chaco. The natives here depended on hunting—the name meaning “hunting ground”. Parts of this area are very swampy, and so are difficult to develop.

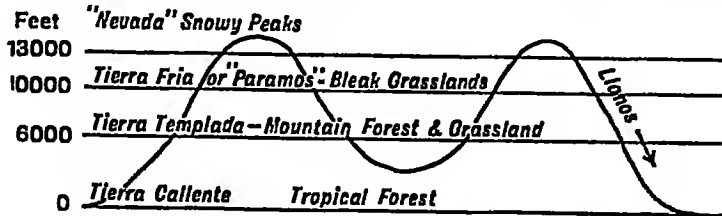
The temperate grasslands.—These are found in the lower basin of the Parana-Paraguay-Uruguay river system. Usually areas having the climate associated with this area are forested, or at least well treed, but this is a region of treeless grasslands known as Pampas, the typical Pampas grass being rather coarse and tough. Since there were few native animals, there was not much development of native life, but these regions have proved ideal for European settlement and have become very important.

The hot desert.—This lies in a narrow strip between the Andes and Pacific from 5° to 28° S. There is no vegetation over most of the area, but in some parts it is crossed by small streams fed by the melting snows of the Andes, and these give rise to patches of fertility which may be compared with the oases of the Sahara. This desert is known as the Atacama desert.

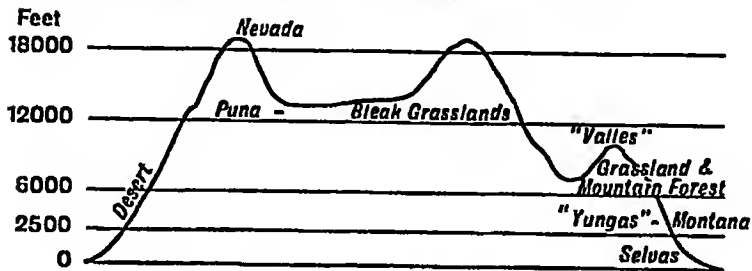
The Patagonian steppes and semi-deserts.—These are in comparatively cool areas in the south of the continent, situated to the leeward of the Andean mountain barrier. Save in certain areas, mainly along the river valleys, the vegetation is exceedingly poor though little of the area is absolutely pure desert. The three main causes of the poor vegetation are the lack of rainfall, the very strong winds to which the region is subjected, and the rather infertile nature of much of the soil. The poor grassland which does exist provided food for the guanaco, an animal which looks like a mixture of a camel and a sheep, and for the rhea or South American ostrich. The inhabitants were a tall, well-built race of hunters, whose nomadic life caused them to live in tents or toldos made of guanaco skins, which usually were erected to face east, and even then had a wind break before the door.

The Andean areas.—The effect of altitude on temperature has already been noted, both in the general work on the world and also in the section on Africa. In South America the Andes give another example of it. Since the Andes stretch the whole length of the continent, it is obviously impossible to make a simple statement of the Andean climatic and vegetation zones, for these vary according to the climates at the foot of the mountain range, and there is a particularly large series of variations along the western slopes of the system. They are, however, of greatest importance in the more tropical parts where they are broadest. All along the eastern slope which adjoins the Amazon lowlands the lower slopes of the mountains are covered with more open forest land known as Montana forest. Above this are areas of grassland and occasional trees, while above this again is an area of poor pastures, the wind-swept high plateaus and upper slopes, and above this the lands of perpetual snows. The native populations, and in more recent times the modern populations, have tended to settle in the valleys and slopes of the second

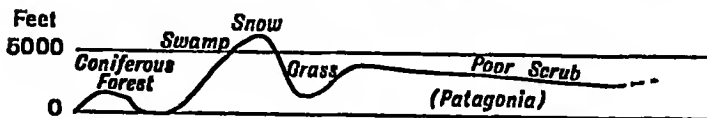
area, where crops of wheat and maize can be grown, while the pasture lands can be used for cattle, sheep and goats, or for the animals peculiar to the Andes—e.g. the llama, which is mainly a beast of burden and the alpaca and vicuña, which are valuable for their hair.



(a) Vegetation Section (Generalised) Lat. 5° N.



(b) Vegetation Section Lat. 17° S.



(c) Vegetation Section Lat. 45° S.

FIG. 54. DIAGRAMMATIC SECTIONS SHOWING THE INFLUENCE OF THE ANDES UPON VEGETATION DISTRIBUTION.

The distribution of the vegetation zones and the names by which they are known is shown in diagrams (Fig. 54).

It was among these mountains that there grew up the famous Inca civilization, which was able to exploit the mineral wealth of the mountains and get the best out of the valleys with the aid of vast irrigation works. Huge stone temples in which the sun was worshipped, big cities, and miles of roads, along which an organized system of posts was run, were all features of this wonderfully well

developed empire, but it collapsed and fell before the onslaught of a mere handful of Spanish adventurers.

Opening up and Development of South America

Africa is a continent mainly divided up into colonies of the great European powers with a self-governing British dominion in the south, Australia is an entire continent forming a British dominion, but South America has an entirely different type of development for which a brief historical background is necessary.

The story of the discovery of the new world by Columbus is familiar; the stories of the subsequent voyages which opened up South America are equally fascinating, but these cannot be dealt with here. The essential points to be borne in mind are dealt with briefly. This region was opened up by the Spaniards and the Portuguese, whose respective spheres of influence were determined by Papal arbitration and later by the treaty of Tordesillas, Spain having regions to the west and Portugal to the east. Portugal's share included the Amazon mouth, so that eventually her influence spread further westward.

The two countries developed their regions in rather different ways, Spain mainly exploiting her regions for mineral wealth. In the period of upheavals connected with the French Revolution and the Napoleonic wars these regions broke away from the "mother" countries and set up as independent states—the Portuguese region forming the large State of Brazil, the Spanish splitting up into nine separate States of varying size and importance. These will be dealt with in their turns.

It must be borne in mind that the population of these States consist of three elements—the remnants of the original natives, the descendants of the European colonists, and a mixed race which has grown up from the mingling of these two. This last element is by far the most numerous. In Brazil there is a further element, for the Portuguese introduced negro slaves from Africa, and these are now freed and form an important part of the population.

In the north there are three small European colonies—the British, Dutch and French Guianas.

EXERCISES ON CHAPTER XIV

1. Draw sections to show the build of South America, (a) at the Tropic of Capricorn, (b) at latitude 45° S.
2. Compare and contrast South America with Australia in build, and with Africa in climate.
3. Describe the effect of altitude upon vegetation as evidenced by the southern continents.
4. "The outstanding physical features of South America are three systems of highlands, three extensive lowlands, and three great rivers." Explain this statement and draw a sketch map on which the features indicated are marked. (O.S.C.)
5. What regions of South America have (a) exceedingly heavy rainfall, (b) a deficiency of rainfall? What effects do the conditions mentioned have upon the vegetation of the regions concerned?

CHAPTER XV

BRAZIL

Position and build.—Brazil has already been mentioned as being the largest State in the continent, and the only one of Portuguese origin. The relationship of its boundaries to the Tordesillas line, and to the access provided by the Amazon, should be noted.

It contains two outstanding physical areas, the Amazon lowlands and the Brazilian plateau. These have already been dealt with in considerable detail; but notice again the way in which the plateau presents a steep face to the sea, and how the deep river valleys, running roughly parallel to the coast, have cut up the surface of the plateau, leaving the intervening areas upstanding like big mountain ridges. In the south the plateau gradually sinks, and the extreme south of the country forms part of the lowlands lying round the La Plata estuary.

It will thus be seen that Brazil has three definite natural regions, the Amazon lowlands, the Plateau and the Southern grasslands, and the plateau stretches far enough to have distinctive regions in the north and south. These regions should be remembered in considering the productions.

Productions and occupations.—When the Portuguese came to Brazil there was no immediate sign of mineral wealth, and they developed the area by means of estates and plantations, so that it became, and still remains, mainly a producer of foodstuffs and raw materials.

Forest products.—These come mainly from the equatorial forest area. The chief forest product was rubber, the rubber tree being a native of the Amazon basin. *Rubber* is made from the latex, or milky sap, of a tree, the sap being obtained by tapping the tree. This process involves making a cut in the bark of the trees and placing a cup below it into which the latex can run. The latex is then coagulated by chemical means or by smoking it over a fire—the latter being the method adopted by native collectors. The rubber industry of Brazil depended on the collection of latex from trees growing wild in the forest, and was carried on by native collectors known as seringueiros who, in their anxiety to get as much rubber as possible, overtapped the trees and so killed them, and were thus forced to penetrate even further into the forest.

This destructive method of cultivation, the scattered nature of the trees, the swampy nature of the "varzea" areas and the insufficient supply of native labour made it impossible for the Amazon area to compete with the rubber-growing plantations worked by coolie labour which were established in Malaya and the East Indies early in this century. Brazil's share of the rubber trade has become less and less.¹

Other forest products are of less importance. Brazil nuts are collected as they form a very valuable food. Balata, a form of gum obtained in a similar method to rubber, is produced chiefly in

¹ Date.	Brazil.	World Total.
1913	45,000 tons	114,000 tons
1935	12,500 "	865,000 "

the area of the Rio Negro tributary. Cocoa is grown to a certain extent in the Amazon basin, but its chief centres of production are in the tropical areas along the coastlands.

Another forest product, coming from the southern forests, is Yerba Maté, known as Paraguayan tea. It is made by smoke drying the leaves of a shrub and forms a very common drink in certain southern districts of South America.

The main centres of these forest collecting industries are Para (Belem) at the mouth (notice that the main entrance to the river is south of Marajos island and then through the "narrows" into the main stream), and Manaos, which is a few miles up the Rio Negro from its confluence with the Amazon. When the rubber boom was at its height a very unprofitable railway was built to overcome the falls on the Madeira tributary.

TROPICAL AND SUB-TROPICAL CROPS.—Coffee.—Brazil has frequently been called the "coffee State", for it is the chief coffee-producing country in the world, and in this case coffee was introduced into Brazil and has thrived better than anywhere else. It is a delicate crop which, in addition to requiring good soil, requires a sufficient but not excessive rainfall and good drainage, and cannot stand frost or excessive heat. These conditions are found on the slopes of the Serro de Mar and the plateau between 20° and 24° S., where the South-East Trades provide regular rainfall and the altitude avoids excessive heat. The coffee can grow up to about 6,000 feet, but the chief producing areas are about 2,000 feet. The soil in this area is rich red iron soil (known as "terra roxa"). The chief centre of the coffee region is the large modern city of Sao Paulo, which has railways extending westwards into the coffee area. The port for this area is Santos, while a good deal of coffee is also exported from Rio de Janeiro. In recent years the coffee industry has been going through difficult times owing to the excess production as compared with the amount the world seems able to consume. This fact has led to the development of other crops in the coffee area, apart from crops grown principally as food. In order to provide shade for the coffee trees beans are often grown between the rows, and these beans serve as a valuable cattle food.

Sugar is grown in wet lowland areas, and Brazil has always been an important producer. The main regions are along the coastlands, especially in the regions of *Bahia* and *Pernambuco*, while it is now of increasing importance in the coffee region. Most of the sugar is

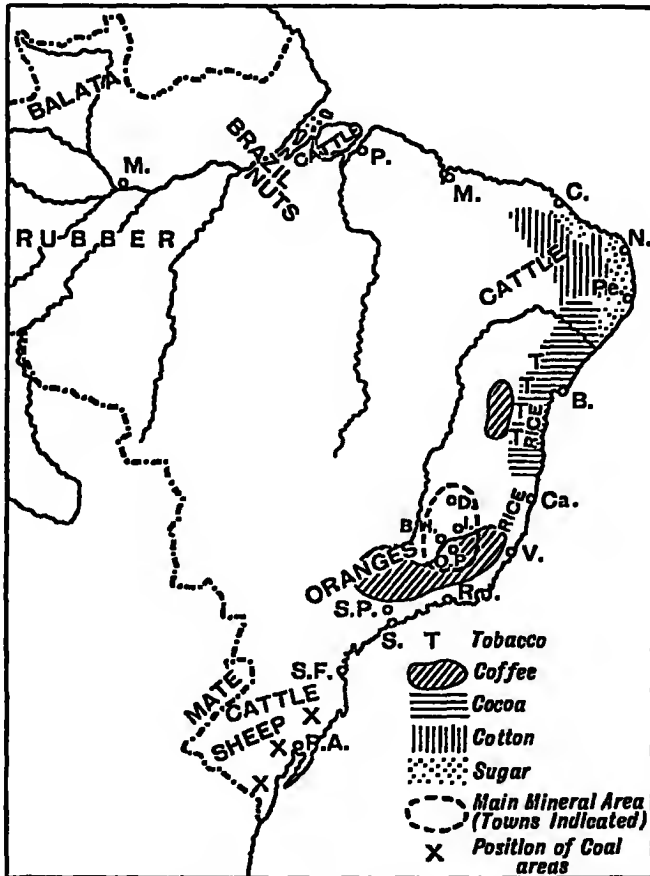


FIG. 56. THE PRODUCTIONS OF BRAZIL.

used in the country, much of it being used for making spirits, and the export is not very important, partly because of poor methods of cultivation, refining and organizing.

Cotton is grown in two areas. The main region is on the coastlands of the north-east, in the area where there is rather a lower

rainfall; for cotton does not require excessive rainfall. It is also being introduced into the coffee area. Much of the crop is used by local industries.

Tobacco is a crop grown entirely for local use. The main centre of the industry is Bahia.

A recent development is the production of rice, which is grown on the southern lowlands, especially in the State of Rio Grande do Sul, where irrigation is used.

Among the recent developments in the coffee area has been the rise of an important production of oranges. These are grown mainly in the Sao Paulo-Rio de Janeiro areas and the export has increased steadily.

Food crops.—Since Brazil is mainly a tropical country it is natural that its primary foodstuffs should be tropical in character. The main food crops are maize, mandioca and various kinds of beans. The beans and maize are grown side by side in most areas, but particularly in southern and central areas. Mandioca is a tuberous root crop which provides flour or farina used for making bread, but is better known to us in the form known as tapioca. It is grown in most parts of tropical South America, and will grow on heights up to three to four thousand feet above sea level.

It is only in the extreme southern States that any wheat is grown, and it is not of great importance.

Cattle.—Since Brazil has both the grasslands of the south and the savanna of Campos areas, cattle rearing is important. The chief cattle area is in the south, where the State of Rio Grande do Sul has large numbers of cattle which, though mainly converted into salted and dried meat, are now also forming the basis of an export of frozen meat. The central region, particularly the State of Sao Paulo, has in recent years developed as the main centre of the chilled meat trade, the cattle being reared both in the coffee area and further west, though the western districts are hampered by lack of transport. Further north, in the drier area, there is a fair amount of cattle rearing and cattle are actually found in Marajos island, where there is a savanna region, but the northern areas lack transport and proper development.

The big maize production of the country, in addition to aiding the cattle industry, is also responsible for a large *pig-rearing* industry. There are few sheep and these are found in the south.

Mining—The plateau area has rich supplies of many kinds of minerals, but these are not yet well developed as they are too far inland and transport is a difficult problem. The chief mining area is in the State of Minas Geraes. The most important mineral is *iron*, of which enormous quantities exist. The iron ore is found from *Ouro Preto* northwards, the main centre being *Itabira*. At the present time the iron is little developed; for there is no fuel available for smelting and transport for export purposes is difficult. It is conceivable, however, that these deposits will be of great value in years to come. There is even more iron further inland still in the State of Goyaz and Matto Grosso.

Manganese is found near *Ouro Preto* and just behind *Bahia*.

Gold is mined in the mineral districts stretching from *Ouro Preto* to *Bello-Horizonte*.

Diamonds are mined near *Diamantina* and also further west in Matto Grosso, while black diamonds are found in the State of Bahia.

Coal, which would be of tremendous value to Brazil, is only found in small quantities in the south, in the States of Rio Grande do Sul and Santa Catharina, and even this small amount is of poor quality, though it is used for the railways to a certain extent.

Towns and railways.—The main towns are ports on the coast and most of these have been mentioned—*Para*, the outlet of the Amazon basin, *Bahia* and *Pernambuco*, the ports of the northern coastlands, both of which, however, are tending to be silted up, *Santos*, the coffee port, and *Porto Alegre*, the outlet of the southern area. *Victoria* is a port which, if a projected railway is completed to reach the iron areas, may become important. *Rio de Janeiro*, the capital, is situated on a magnificent harbour and has railways running both westward to the coffee area and northward to the mineral region. The railways are mainly lines linking up the ports with the various productive regions of the plateau and the coastline, but there are a variety of gauges and no really organized system.

EXERCISES ON CHAPTER XV

1. Explain why the Amazon has been described as a "magnificent waterway wasted".
2. Compare and contrast the basin of the Amazon and the Congo under the headings (a) build, (b) climate, (c) development.
3. What geographical factors have retarded the development of the interior of Brazil?
4. What are the possibilities of manufacturing industries being developed in Brazil?
5. Make a list of the ports of Brazil, naming the areas they serve and their main exports.
6. What crops could Brazil develop in order to avoid being so dependent on the production of coffee? To what extent are these being developed?

CHAPTER XVI

STATES OF THE LA PLATA BASIN

Argentina

Position and build.—Argentina lies principally to the west of the La Plata estuary and the central stretch of the Parana, but it also includes the Patagonian plateau and the tongue of land lying between the Parana and the Uruguay which is known as the "Entre Rios" district. It is thus mainly a vast lowland area, save for the plateau in the south and the eastern slopes and foothills of the Andes.

Climate and vegetation.—Reference to the chapter on climate will show that Argentina has three main climatic areas—the tropical region of the north (No. 3), the warm temperate eastern margin area of the centre (No. 6), and the cool temperate eastern margin in the south (No. 8). The main vegetation area is that of the Pampas, the vast grasslands lying round the La Plata estuary.

Towards the Andes the rainfall diminishes and these grasslands

give place to rather semi-desert conditions. In the north are the forests and swamps of the tropical Chaco, while in the south is the semi-desert of the Patagonian plateau.

It is thus possible to distinguish several natural regions in the country, viz. the tropical Chaco, the Pampas area, the Entre Rios area—which is a transition between the two former, the Patagonia

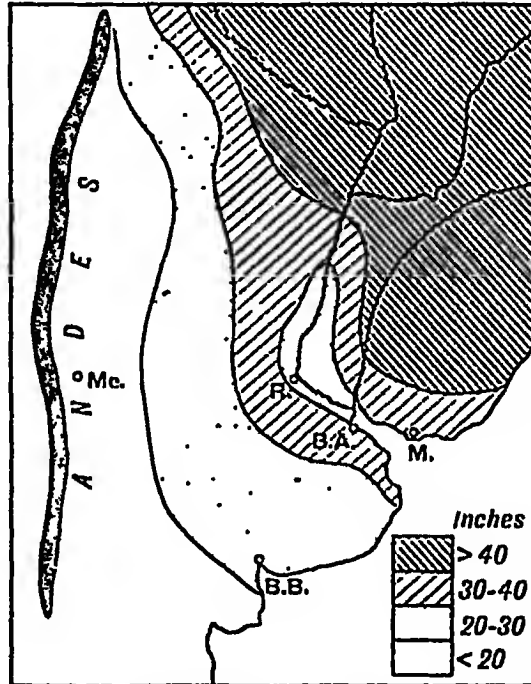


FIG. 57. RAINFALL OF THE LA PLATA REGION.
Compare this with production maps.

plateau and the Andine region, of which the most important parts are the foothills and lower valleys.

Development, productions and occupations.—Argentina is a well developed State as compared with many South American countries. This can be ascribed to two main causes—the more temperate climate which has allowed of fuller development by European peoples, and the comparatively level land which has made communications easy. The land round the La Plata estuary contained no

mineral wealth and was for long neglected by the Spaniards, but it has developed more surely than many of its neighbours. The vast grassland areas had few native animals, and none that could have been domesticated. The coming of Europeans meant the introduction of cattle, which soon developed on the Pampas and have been responsible for Argentina's progress. For that reason we will consider Argentina's pastoral occupations first.

Cattle farming.—The cattle which were brought to the La Plata estuary at first roamed in a comparatively wild state over the grasslands, and the first development was the rounding up and slaughtering of vast numbers of them for the sake of their hides. This led to the big estancias or ranches with their picturesque half-breed "gaucho" riders. The meat was largely wasted, though it served as the main food of the gaucho (whose daily allowance was five pounds), and some of it was dried or salted for export. This was the first stage of the cattle farming. The next was the manufacture of meat extracts from some of the meat, and from this has developed the modern meat extract industry—with its well-known brands such as Oxo and Bovril. This needed more care in the selection of the cattle and so reduced the size of the average estancia. Finally came the discovery of refrigeration, and Argentina entered into its modern stage. The wild or semi-wild cattle suitable for hides and meat extract were quite unsuitable for the meat trade, and three important changes have been made:

The estancias have been fenced in to prevent the cattle roaming wild.

Vast sums of money have been spent on buying pedigree animals, mainly from Great Britain, in order to bring up the quality of the Argentine animals.

The coarse pampas grass has been replaced with fields of alfalfa—a fodder crop which yields a rich cattle food and can be cut many times before it needs re-planting.

In order to ensure that the industry should keep its markets, there is strict supervision of the trade. The animals are killed at the "frigorificos" and graded according to their quality, so that customers abroad can rely on the meat. Argentine meat is largely sent to Europe in a chilled state, and so is much more edible than

the meat which comes from a greater distance and has to be "frozen". In addition, of course, there is still a large export of hides and skins.

As will be seen from the map (Fig. 58) the cattle are reared mainly in the wetter region immediately round the La Plata estuary and in the Entre Rios area. With the intensifying of the system of

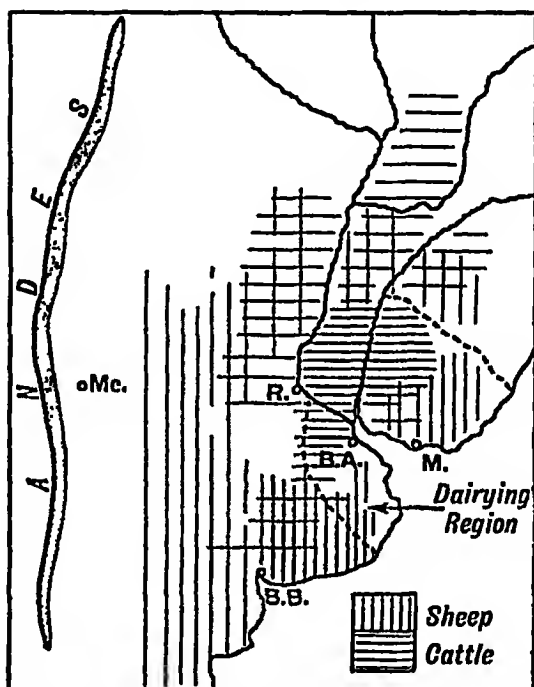


FIG. 58. PASTORAL OCCUPATIONS IN THE LA PLATA REGION.

Compare with rainfall map.

cattle farming another development must be noted. This is the growth of a dairying industry in the region south of Buenos Aires. This is quite a natural development, and an export of butter and cheese is developing, as well as one of casein, a substance made from milk and used in the manufacture of combs and similar articles.

Sheep are also reared in large numbers. They are found in the area near the La Plata, but extend southwards into the drier areas of

Patagonia and are also reared in the mountain areas in the west. As the Pampas area becomes more closely developed the number of sheep there is tending to decrease, while the number of sheep in Patagonia is increasing, and this area will probably become the main sheep rearing area in time, particularly when railways have been developed in the areas south of Bahia Blanca. There is already

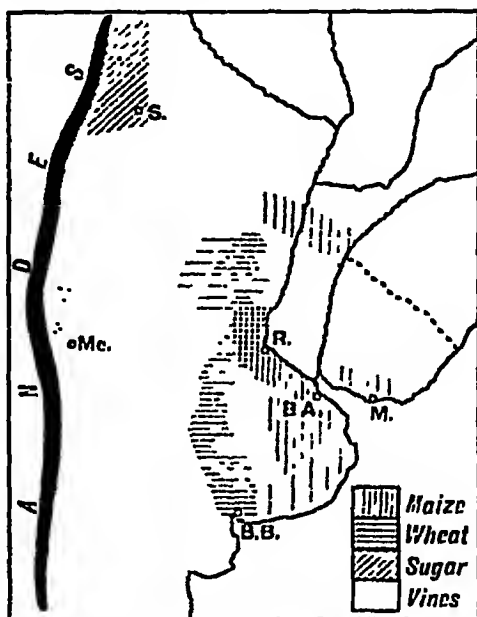


FIG. 59. MAIN CROP AREAS OF THE
LA PLATA REGION.

Compare with rainfall map.

a large export of frozen mutton and wool, the wool being clipped mainly in October.

In addition to cattle and sheep there are also large numbers of horses in the country, as well as pigs and goats.

Grain crops.—With the closer development of the country Argentina is becoming more and more important for its agricultural products. The most important cultivated crop, alfalfa, has already

been mentioned in connection with cattle rearing. The two chief grain crops are *wheat* and *maize*, and the distribution of these illustrates the climatic control of crops. Maize is grown in the warmer and wetter areas lying from *Buenos Aires* up to *Rosario* and into the Entre Rios area, while the wheat is grown inland and south of this in cooler and drier regions. The main wheat belt stretches from *Rosario* to *Bahia Blanca*, which are the chief exporting centres. Argentina has a large export of wheat, for it has a big production in comparison with its population. Also, of course, it comes into the market during the European winter season. The time of the Argentine harvest is important for another reason. The labour difficulty can be met by transporting workers from Spain and Italy to Argentina in order to reap the Argentine harvest, but who return home again in time for the harvests of their own northern lands. Maize is also exported in large quantities, principally for use as a cattle food.

Another important crop is *linseed*—or *flax*. When this plant is grown in hot countries it is valuable for the seed it produces, which is the source of linseed oil and of valuable cattle foods.

Oats, barley and rye are grown in smaller quantities, but are not very important articles of export.

Other crops and products.—In the more tropical north other crops are to be found. Chief of these is *sugar*, which is grown on the better drained Andine area, and where communication is provided by the railway running from Buenos Aires to Bolivia. The main centre is *Tucuman*, other centres being *Salta* and *Jujuy*. Other crops of this region are *cotton*, *rice*, and *tobacco*, which supply the needs of the country.

Fruit growing is developing. The main centre is in the Andine area round *Mendoza* and *San Juan*, where irrigation can be practised. There are important *vineyards* which supply the country with *wine*, and there is also an export of grapes, *peaches* and *apricots*. Attempts are being made to develop *orange* growing in Entre Rios. The forests of the Chaco are important as the source of *Quebracho*, a tree from which a valuable tanning material is obtainable. Argentina has hardly any mineral wealth, but *oil* has been found in the Andine

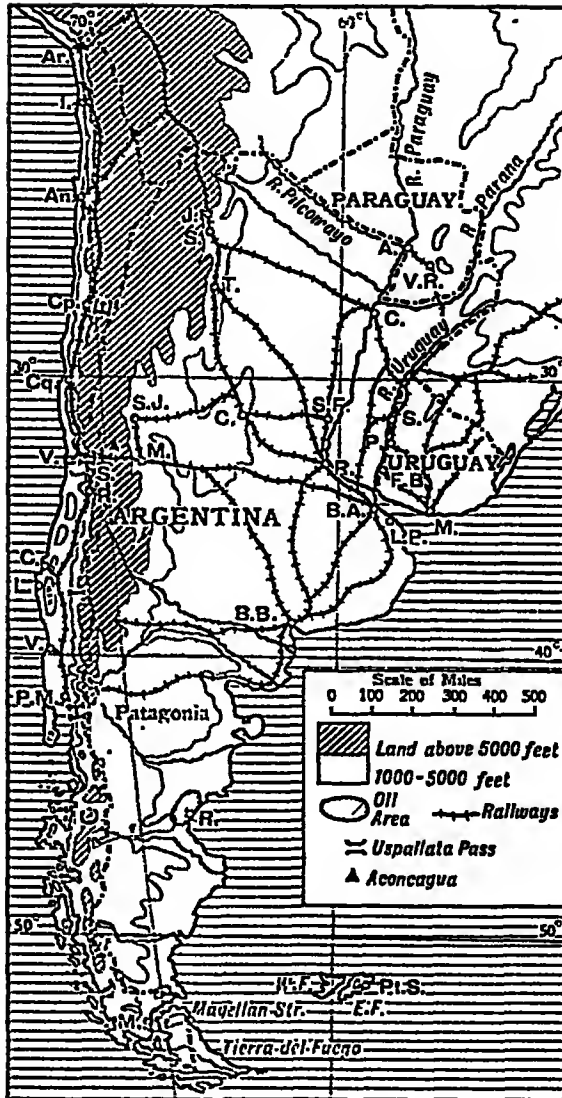


FIG. 60. THE STATES OF THE LA PLATA BASIN, AND CHILE.

Identify the towns.

area and in Patagonia. The main centre is Rivadavia in the Gulf of St. George.

Towns and railways.—Many of the towns have already been mentioned. The capital, Buenos Aires, is the largest city of the southern hemisphere and is finely laid out on the shores of the La Plata estuary. Its harbour has had to be improved by artificial means. It is the centre of the big railway development of the country. Other ports are Rosario on the Parana, Bahia Blanca and La Plata, while Cordoba is an old town which is an important centre of the cattle ranching industry.

The importance of the level country in helping communication has already been mentioned. Many railways have been built to form the best railway system of South America. The main lines radiate fanwise from Buenos Aires, with Bahia Blanca, Rosario and Cordoba as lesser centres. Many of the railways have been built by British capital. Two of the main lines to note are the Transandine to Chile via Mendoza, and the railway to Bolivia. Unfortunately, three gauges are found—metre, standard, and broad—so that the system is not so valuable for internal transport as it might be, but it is excellent for its main purpose of linking the interior regions with the coast for purposes of export and import.

PARAGUAY AND URUGUAY

Situated between Brazil and Argentina are two small States, Paraguay and Uruguay, which closely resemble the parts of the two larger countries which they adjoin.

Paraguay

Paraguay is an inland country lying on either side of the river from which it takes its name. It is so situated that it can be regarded as a transition area between the tropical Matto Grosso region of Brazil in the north and the warm temperate Pampas area in the south. The regions along the Brazilian border and the Chaco area are forested, but the rest of the country is grassland.

Its inland position, small population and rather chequered

history combine to retard its development. The Chaco area, save for producing a certain amount of *Quebracho*, is practically undeveloped. In the grassland areas *cattle* are reared, but are only fit for the production of *hides* and dried or tinned meat. *Yerba Matè* is a natural product and is exported to Argentina, and plantations are developing. *Tobacco* is exported to some extent, while recent improvements in marketing methods may lead to a bigger development of an orange trade which already exports in fair quantities, but which suffers from lack of quality. *Maize* is the chief food crop.

The only towns to note are *Asuncion*, the capital, which has both rail and river connections to *Buenos Aires*, and *Villa Rica*.

Uruguay

Uruguay, the smallest South American State, lies between the Uruguay river and the sea, and the entire state may be included in the Pampas region, resembling Southern Brazil more closely than Argentina. The climate is of a very pleasant warm temperate type.

The country has been described as "one big ranch" and this is hardly an exaggeration. The rearing of *cattle* and *sheep*—particularly the latter in recent times—is the main occupation of the country. The animals are allowed to graze on the natural pasture, there being no development of *alfalfa* as in Argentina, and the types of cattle reared are not so good, though *sheep* of excellent strain have been introduced.

The main towns connected with the meat trade, apart from *Montevideo*, are *Fray Bentos*, *Paysandu* and *Salto*, all situated along the river Uruguay, which is navigable as far as Salto.

Apart from its pastoral industries Uruguay shows little development. *Maize* is grown in the north and *wheat* in the south, but there is little surplus for export. *Linseed* is exported and there is a beginning of fruit export.

The capital is *Montevideo*, situated on a bay near one of the few hills of the country. It is connected by rail to most parts of the country, railway building having been developed largely by British capital.

EXERCISES ON CHAPTER XVI

1. Why should there be a large trade between Argentina and Great Britain?
2. Compare and contrast the foodstuffs exported from New Zealand and Argentina. How far is their production controlled by the climate of the two regions? (O. and C.S.C.)
3. Discuss the part played by pastoral industries in the development of the La Plata area.
4. Why do so many railways converge upon Buenos Aires as compared with Rio de Janeiro?

CHAPTER XVII

CHILE

Position and build.—This country occupies an unique position, for it stretches along the west coast of South America between the Andes and the Pacific from about 18° S. to Cape Horn, so that it has a length of 2,800 miles, but an average width of only 100 miles.

Its build is not so simple as would at first appear, for between the Andes and the sea lies another lower range known as the coastal range. This rises steeply from the seaboard, and slopes more gently inland. Between it and the Andes lies a valley which is generally known as the *Longitudinal Valley*, and which forms the main portion of the country. This valley is not continuous, for it is often broken up by spurs both from the Andes and the coast range, and flowing across it are several short swift streams which flow direct from the Andes to the sea, making gaps in the coast range.

In the south the land has sunk, the coast range becoming a line of islands of which the chief is Chiloe, while the valley continues as a strait between the mainland and the islands.

In the extreme south the whole of Magellan Strait forms part of Chilean territory.

Climate and natural regions.—Owing to its extent Chile presents a variety of climates, and is, in fact, an excellent example of the procession of climatic types that are to be met with on the west coasts of a land-mass from tropical to temperate areas. In the north lies the Atacama desert—to all intents rainless. Coming south is the region of winter rain, the warm temperate western margin type (No. 5), and going southward the rainy season gradually increases in length till the regular rain area of the cool temperate western margin type is met with (No. 7). The entire country has its climate modified by the cool Humboldt current, and the coast range tends to catch a good deal of rainfall, to the detriment of parts of the valley. The streams crossing the valley are, however, of value for irrigation. It can thus be seen that the country will consist of three distinct areas—northern, central and southern—of which the central has the most pleasant climate, and which has, in fact, earned it the name of "Garden of South America".

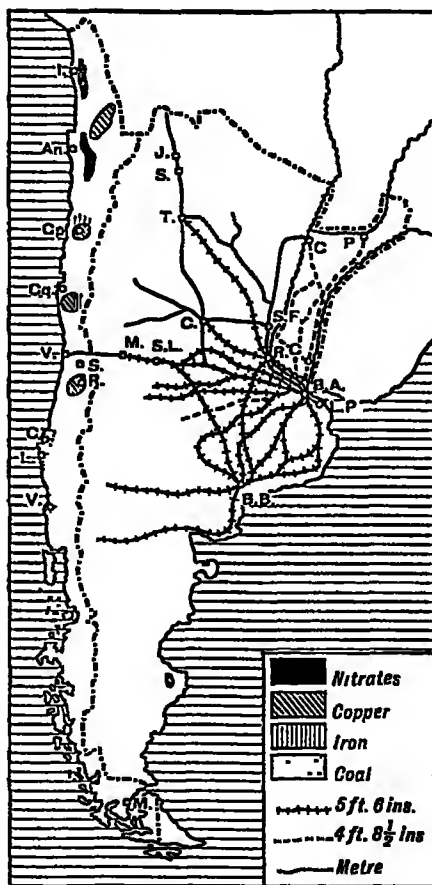


FIG. 61. RAILWAY DEVELOPMENT OF ARGENTINA AND MINERALS OF CHILE
(Note the variety of gauges.)

Development, productions and occupations.—The fertile central region early led to settlement by the Spaniards, and the healthy climate has made the Chileans a very virile people of South America. Chile's rise is, however, due to its mineral wealth.

Minerals.—The desert area of Atacama, apparently valueless, has proved of great value, for in it lie vast deposits of nitrates, which the arid climate has preserved in rock beds known as caliche and found a few feet below the surface. This rock is blasted out, the nitrates are extracted and are exported from this barren region to act as fertilisers for other parts of the world. The Chilean nitrate trade is now suffering from severe competition from "synthetic" nitrates, which are manufactured very cheaply, but it has one big advantage. Mixed with the nitrate are supplies of iodine, and after enough of this has been extracted to supply the world's demands there is still enough left behind in the nitrates to make the iodine contents valuable, for Chilean nitrate thus contains iodine which is lacking in synthetic nitrate, so that many farmers are prepared to pay a higher price for Chilean nitrate.

The main ports serving the nitrate areas are Iquique, Antofagasta and Arica. They are really only roadsteads, the vessels lying offshore and being loaded from lighters. Water has to be brought from the valleys of the Andes. From them railways run inland from the nitrate fields, and from both Arica and Antofagasta railway lines cross the Andes to serve the towns of the Bolivian plateau.

In addition to nitrates Chile has other valuable minerals. Chief of these is copper, of which it is the second largest producer in the world. The copper is found in the Western Andes, and is mined chiefly by big American companies. The main centres are along the railway inland from Antofagasta in the areas round Coquimbo and Copiapó just south of the desert areas, and near Rancagua just south of Santiago.

There are also large supplies of iron ore which are worked near Coquimbo, and exported from Cruz Grande.

In the south near Lota, Coronel and Lebu are the most important coal deposits in South America, enough being produced to supply the country's railway needs.

Small amounts of *silver* and *gold* are mined as by-products of the copper.

Farming.—This is naturally carried on mainly in the central district, which has been comparatively closely cultivated. The main crops are *wheat*, *oats* and *barley*, but only barley and oats are exported and then in small quantities, for a good market for most of the grain is found in the mining areas. Since the area has a “*mediterranean*” climate it naturally grows *fruit*. *Grapes* are important and a *wine industry* is being developed. Other *fruits*—*peaches*, *melons*, *apples* and such like—are grown, and they are able to find a market in New York, where they arrive during the winter. *Vegetables* share this trade which has been made possible by the opening of the Panama Canal.

Some *cattle* are reared, but the chief animals are *goats*, which are reared in the transition area between the desert and the farming region, and *sheep*, which are mainly reared in the small Patagonian area lying behind *Magellanes* (Punta Arenas) on the Magellan Straits.

The southern area contains valuable *timber* supplies, but they are not easy of access and the climate does not encourage settlement.

Towns and railways.—The mining towns have already been mentioned. The chief town is *Santiago*, which lies in a fertile valley in the centre of the country, and near the western end of the *Uspalata pass*. *Valparaiso*, the chief port, is three hours’ journey away. It is situated on one of the few harbours lying along the west coast of the continent, and even that is rather open to north-west winds. It has rail communication by Trans-Andine Railway to Buenos Aires.

Concepcion is the main town in the south of the farming area and is near the coalfields. It and *Valdivia*, also in the south, are the centres of the cattle rearing regions.

Owing to its shape Chilean trade can be carried on mainly by sea, with only short railways running inland from the ports, and many of these were built quite independently of one another, and of gauges varying from 2 ft. 4 in. to 5 ft. 6 in. For military reasons the government has built the *Longitudinal railway*—running along the valley and linking Santiago with *Iquique* in the north by a metre gauge line and with *Puerto Montt* in the south by a broad gauge line.

EXERCISES ON CHAPTER XVII

1. Both Chile and Brazil have been described as "one product" countries. To what extent is this description true? How far do geographical features make such a state of things unnecessary?

2. What geographical factors combine to control the climatic areas of Chile?

3. Why can northern and central Chile be described as "complementary"?

CHAPTER XVIII

THE ANDEAN STATES AND EUROPEAN COLONIES

Position and build.—Lying in the western part of tropical South America is a group of States which may be designated the Andean States, for they are unified by the chains of the Andes which form a kind of backbone through them. Further, since they are within the tropics, it is mainly in the valleys and plateaus of the Andes that we find the human developments of these States, and it was in the Andes that were found the supplies of mineral wealth—particularly gold and silver—which first attracted the Spanish.

The general features of their build may be noted in the sketch map showing the main cordilleras of the Andes (Fig. 52). It will be seen that in the main there are three distinctive physical areas, viz. :

The narrow coastal region between the Andes and the sea.

The Cordilleras with the plateaus and valleys.

The inland plains drained by eastward flowing rivers.

The outstanding points concerning the build of the separate States can be picked out from Fig. 52. It should be noted that Bolivia has no coastal plain but is an entirely inland state (its small coastal strip in the Atacama desert having been ceded to Chile after the Pacific or Nitrate war of 1879-1883, when Chile defeated Peru and

Bolivia in the struggle for possession of the nitrate areas). Further, Bolivia's mountain area is made up of the plateau of Bolivia—the altiplano—and its eastern area partly of Amazon lowlands and partly the Chaco area of the Paraguay system.

Peru and Ecuador present the three normal physical areas, but Colombia has a double coastline, on both Pacific and Caribbean, and the coastal area facing the Caribbean is rather broader than that of other regions as it has been built up by the rivers Cauca and Magdalena which drain direct to that sea. In Venezuela the mountain chain is very close to the sea and there is very little coastal area, save round the shallow Gulf of Maracaibo. Also its inland area contains the main basin of the Orinoco, while in the south is another highland region, the Guiana plateau area.

Climate and vegetation.—Naturally there are variations of climatic type within this large area, but the most important is the area of mountain climate (No. 9) which, as has been noted, here plays a very important part in bringing temperate climatic conditions within the tropics. The details of this influence should be referred to and Fig. 54 studied again.

Apart from this mountain region the following details should be noted. The coastal lowlands show three areas—the desert region of Peru (No. 4), the equatorial region of constant rainfall of Ecuador and Western Colombia (No. 1) and the tropical marine area, with more seasonal rainfall in Northern Colombia and Venezuela (No. 2). Thus, with the exception of Peru, the coastal area is mainly one of forests, though parts of the Magdalena lowlands of Colombia are sheltered by the Santa Marta mountains and, being somewhat drier, contain a fair amount of grassland.

The interior lowlands of Ecuador, Peru and North Bolivia consist of the equatorial lowlands of the Amazon basin (No. 1) with their selvas forest.

In south Bolivia lies a region of tropical Chaco forest (No. 3) and in north Colombia and Venezuela lies the tropical region of the Orinoco basin (No. 3) covered with the llanos grasslands. The lower slopes of the Eastern Andes are covered with the Montana forest.

which are reared in herds, and *vicuñas* which are wild, are important as a source of wool and fur.

The production of rubber and quinine from the forests is now of little importance owing to the development of East Indian plantations, but *coca*, from which comes cocaine, is still an important product, while the coca leaves are chewed by the natives and, acting as a drug on the stomach, enable them to perform surprising feats of endurance.

The main mining towns have been mentioned. The chief city is *La Paz*, situated in a valley near Lake Titicaca. The official capital is *Sucre*, which is in a fertile agricultural area. The main towns are now reached by railways from Arica and Antofagasta in Chile and from Buenos Aires, while steamers on Lake Titicaca link up the Bolivian railways with the line to *Mollendo* in Peru. The chief centre of the railway system is *Oruro*.

Peru

Attention has already been directed to the three distinctive areas of Peru, and to its part in the early history of South America. The centres of population may be divided into two groups—those found in the valleys and plateaus of the Andes, and those found in the irrigated valleys which cross the coastal desert. The eastern areas are of little real importance.

Minerals first attracted development and so are considered first.

The main mineral of Peru is *copper*, and this is chiefly mined in the area lying round *Cerro de Pasco*, this region being served by a railway to the central railway at *Oroya*. From this area also come supplies of *silver* and *gold*, and there is a certain amount of *coal mining*. There is a variety of other minerals which are produced in small quantities, and in the central coastal districts are undeveloped deposits of iron ore.

Of great importance in recent years has been the development of the *oil field* in the very north of the coastal area. The main oil field is in the *Lobitos* district lying north of *Payta*, which is served by the port of *Talara*.

Agriculture is carried on in the mountain valleys and in the irrigated coastal valleys. In the former the chief crops are maize in the lower valleys and wheat in the higher ones, while barley is also an unimportant crop. These mountain valley areas grow their crops as a local food supply. In the coastal valleys the two main crops are sugar and cotton, both of which are exported. The cotton grows under conditions similar to those of Egypt. Sugar is the more important and a good deal is exported to Chile. Cereals, fruits and vegetables are also grown in these areas and there is some export to the nitrate areas further south.

The eastern forests contain supplies of coca, cacao, rubber and quinine, but these are of little importance save where they are within reach of the export facilities provided by Iquitos, the Amazon river port.

In the mountain areas, particularly in the south, there is a good deal of pastoral farming. The main animal is the sheep, and there is quite a large export of wool. Llamas and alpacas are also reared, and there is some cattle farming.

The main towns are either ports or valley centres. The capital is Lima, situated in the fertile Rimac valley and some eight miles inland from its port of Callao. From it runs the Central railway inland to Oroya, which ascends to a height of 15,680 feet to cross the Western Cordillera—a marvellous piece of railway engineering.

In the south is the port of Mollendo, from which a railway runs inland to Arequipa, an agricultural centre, and thence to Cuzco—the old Inca capital, in which are many relics of the old architecture of that civilization. A branch from this railway to Puno on Lake Titicaca connects by steamer with Bolivian lines.

In the north of Peru the main ports are Payta and Trujillo, each with short railways running inland to serve the railways behind them, and there are many other smaller ports of similar nature.

Ecuador

This small country lies, as its name implies, on the equator, and is mainly agricultural. Its coastlands are hot and are important

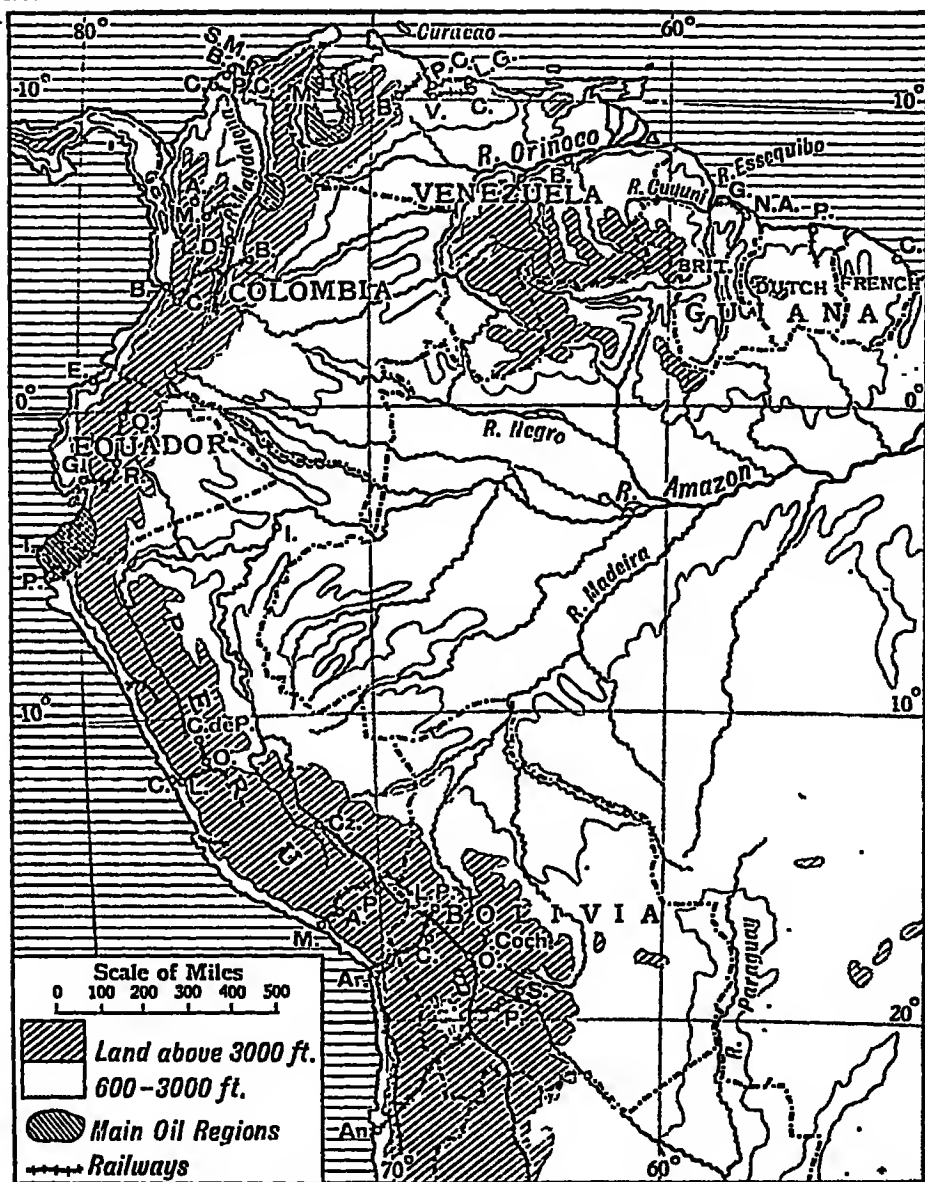


FIG. 63. THE ANDEAN STATES AND THE GUIANAS. -
Identify the towns marked.

- Note—(i) the isolated railways ;
(ii) the undeveloped interior lowlands ;
(iii) the scattered centres of population.

as having been one of the original sources of *cacao*, and that commodity still provides the main source of wealth, though production is small compared with the West African crops. Apart from this the main crops are *maize* and *rice*, which provide the chief food crops. An interesting production of the coastal forests is the *Tagua* nut from which vegetable ivory is obtained.

The main populated region is the plateau area, which, in addition to growing cereals, is one of the centres noted for the manufacture of *Panama hats*, these being made by hand from a certain type of palm straw.

In the coastal area south of the Gulf of Guayaquil is an *oil field* which is the continuation of the Peruvian oil area, the oil being exported from a special port, *La Libertad*.

The main town, *Quito*, is situated practically on the equator, but owing to its elevation has the temperatures of an English spring. It is connected by rail to the main port, *Guayaquil*, which, despite being situated in the hot wet coastland, is the chief commercial centre of the country. The difficulty of communication in such regions is shown by the fact that the 290 mile rail journey from port to capital takes two days, with an overnight stay at *Riobamba*!

In the north of the country is the small port of *Esmeraldas*, which is the centre of a fertile area.

Colombia

Colombia is unlike the other North Andean States in having a double coastline, and the extra width of the northern coastlands has already been discussed. The main centres of population, however, are inland on the plateaus and valleys of the Andes, and particularly in two centres—round *Medellin* in the central cordillera, and round *Bogotá* in the eastern cordillera, while the upper Cauca valley is also important.

The main crop of the country is *coffee*, which is grown on slopes up to nearly 7,000 feet. The Colombian coffee is of good quality and so has a fair sale even in these days. Other tropical productions are *cacao*, *sugar*, *tagua nuts* and *bananas*. The last named are now of

great importance. In the peninsula behind *Sta. Marta* is one of the big world sources of this fruit, big plantations having been developed largely by American capital. The fruit is exported to U.S.A. and Great Britain in special fruit-carrying steamers, with holds in which the bunches can hang and be maintained at an even temperature.

There is a certain amount of *cotton* cultivation in the Cauca valley, leading to a small local manufacture at Medellín.

Wheat, *maize* and *rice* are grown as food crops in regions which vary with the climate.

Cattle rearing is important in two areas—on the llanos behind the Andes, and on the grasslands that are found in parts of the northern plains, and there is some export of lower grade frozen meat.

Minerals are important, and Colombia has the distinction of being the main source of world supply of *emeralds* and *platinum*, the former coming from near Bogotá, and the latter in the valleys of the *Atrato* and *San Juan* rivers, which lie between the western cordillera and a lower coastal range which continues into the Panamá isthmus.

The main mineral wealth, however, now comes from the *oil* fields that are found on the western slopes of the eastern cordillera where it abuts the Magdalena lowlands. The production of this area has rapidly become important, especially now that there is a pipe line some 350 miles long which runs to the coast near *Cartagena*.

Gold is mined round *Antioquia* and *coal* round *Cali*—the main centre of the upper Cauca valley.

The towns are found either along the coast or in the mountain areas, and the latter are very difficult of access.

The main port is *Barranquilla*, near the mouth of the Magdalena, the actual port being *Puerto Colombia* at the mouth. From here river steamers ascend the Magdalena to the rapids at *La Dorada*—a 600 mile journey taking six days. From here there is rail or road connection to *Bogotá*, the capital, which is the main centre of a fertile plateau area.

Cartagena is a famous old Caribbean port which is connected to the Magdalena both by rail and a small canal.

Buenaventura is the main port of the Pacific coast, and from it a railway runs to *Cali* in the Cauca valley. The interior is still badly

served by railways but air transport is used for connecting the capital with the coast.

Venezuela

The name Venezuela means "little Venice"—so called by early explorers because of native villages built on piles over the Gulf of Maracaibo. Its physical features are rather unlike the other Andean states and reference should be made to them.

The main centre of population is the plateau area lying immediately inland from the central coastal area, but the most important source of wealth is oil. The Venezuelan oilfields lie round the Gulf of Maracaibo, and Venezuela is the third largest producer of oil in the world. The gulf is shallow and much oil has been sent to the Dutch island of Curaçao for refinement and transhipment, but pipe lines are now being built to deep water harbours.

A certain amount of copper is found near Barquisimeto and coal near Barcelona, but these are not of great importance. Gold is found in the Guiana Highlands near the borders of British Guiana.

The main agricultural product of the country is coffee, which is grown in the regions round Caracas and Valencia and from which there is a considerable export. Cacao is an important export from the coastal areas. Cotton is grown in the coffee districts and there is a local manufacture at Caracas. Sugar and tobacco are other important crops, while the main food crop is maize. The llanos contain large areas suitable for cattle rearing, but lack of transport hinders development, the main export being hides rather than meat.

The chief town is Caracas, which is in the centre of the most fertile part of the country on a plateau at an altitude of about 3,000 feet. It is connected by rail to its port, La Guaira, and to Valencia, an important agricultural and manufacturing centre, whose port is Puerto Cabello. Maracaibo is the centre of the oil industry and exports coffee.

The chief centre of the llanos area is Ciudad Bolivar, an inland port in the Orinoco, and it is the main centre of trade for the basin of that river basin. Steamers ply between it and Trinidad, but navigation is hindered by the delta.

EUROPEAN COLONIES

South American civilization has been mainly of Latin origin, and the various areas broke away from their original "mother countries" at the beginning of last century. However, Spain and Portugal did not have a complete monopoly in the continent, and there are small colonies belonging to Britain, France and Holland.

The Guianas

Position and build.—In the north-east are the colonies of British, Dutch and French Guiana, lying in that order between the mouths of the Orinoco and the Amazon—but not reaching either—and extending inland as far as the watershed that marks the Amazon drainage of the Eastern Guiana Highlands. These natural limits make British Guiana larger than the others owing to the trend of coast and mountains.

They all contain three fairly well marked areas. First comes a narrow coastal region made of alluvial soils and rather swampy. Behind this is a region of firm soils gradually rising inland to the third area—the uplands of the Guiana Highlands.

Climate and vegetation.—Situated as they are on the north-east coast, the colonies have a tropical climate and tend to be unpleasantly humid, especially in the coastal areas. As a result the lowland areas are covered naturally with thick forests which can only be easily penetrated by river. Luckily the build and rainfall lead to the formation of many rivers which are used in the communications of the country. The Guiana Highlands have a lower rainfall and are better drained so that they are savanna lands.

Productions.—The most important part of the colonies is the coastal area with its fertile soil and tropical climate. The most important product is *sugar*, which is exported mainly from British and Dutch Guiana. In both colonies production has been helped by the ability of the two powers to introduce coolie labour from India and Java respectively and so overcome the labour difficulty that always arises in South America. As a result of these labourers, the second most important crop in both is *rice*, and from the British

area there is a surplus left for export. Cacao and coconuts are also fairly important, while the natural forests provide supplies of balata gum—more particularly from French Guiana, which has been very little developed compared with the other two. The forests also supply valuable timbers—mainly of the tropical hardwood type, and especially “greenheart” wood, but as yet this asset has not yet been given a great deal of attention.

Recently attention has been directed to the possibility of cattle rearing in the savannas, but, though a start has been made, transport facilities will have to improve before much progress can take place.

The colonies were once very important for their productions of diamonds and gold. Both are still produced, and they are obtained from the river gravels in the forest-covered area between the coast lowlands and the highlands. The chief gold-producing area is now in the valley of the Cuyuni river in British Guiana. The most important mineral now, however, is bauxite, a kind of clay from which aluminium is extracted. It is exported in considerable quantities from the British and Dutch colonies.

Towns.—The main town of British Guiana is Georgetown at the mouth of the Demarara river. Its old name was Demararā and it gave its name to the brown sugar which the colony exports. It has rail connection to New Amsterdam at the mouth of the Berbice river; and steamer connections to the Essequibo, the largest river in the colony.

Paramaribo and Cayenne are the capitals and only towns of importance in the Dutch and French colonies respectively.

The Falkland Islands

Lying some three hundred miles to the east of the Magellan Straits are the Falkland Islands of which only two—East and West Falkland—are of any size and are inhabited.

The surface of the islands is rather hilly and there is also a good deal of peat. The climate is not inviting, for though the winters are not very cold the summers are cool and it is generally cloudy,

while the winds are strong and constant. This last fact is usually regarded as explaining the complete absence of trees.

Agriculture is almost impossible, and the only occupation is sheep rearing, wool being exported in fair quantities. Whaling is carried on from Port Stanley, the capital and only town, which is situated in East Falkland.

EXERCISES ON CHAPTER XVIII

1. What part has oil played in the development of South America?
2. Describe and explain the distribution of population in the Andean States of South America.
3. What geographical facts have led to the growing of (a) sugar in Peru, (b) bananas in Colombia, (c) cocoa in Ecuador?
4. What facts hinder the development of the interior lowlands of the Andean States?
5. Describe and explain the positions of the capitals of the Andean States.

REVISION EXERCISES ON SOUTH AMERICA

1. What areas south of the equator in South America are noted for the production of (a) maize, (b) wheat, (c) sugar? In each case state the particular features that have helped in the development of the crop.
2. Explain the geographical factors underlying the following statements. (a) Though not the largest of the South American States, Argentina has the greatest trade returns. (b) In Chile both mining and farming are important. (c) The political unity of the United States of Brazil is hard to achieve. (J.M.B.S.C.)
3. Draw a sketch map of South America showing the location of areas producing wheat, coffee, and nitrates, and state the geographical factors underlying the production of any two of these commodities. (L.C.S.)
4. To what extent is it true to say that South America has been handicapped by a lack of population?
5. "With the exception of one area, South American railways are disconnected lines between ports and isolated inland production areas." Discuss this statement.
6. Peru was the chief area of South America in the days of Spanish control, but it is now comparatively unimportant. Give reasons for this change of affairs.

CHAPTER XIX

THE NORTHERN CONTINENTS

A STUDY of a globe will show one big difference between the northern and southern hemispheres, viz., the much greater proportion of land as compared with sea that is found in the northern hemisphere. This difference has important effects, especially so in the case of climate. In Chapter IV it has been shown how the unequal heating and cooling of land and sea influences pressure and wind systems. In the southern continents land-masses are large enough to have some modifying influences on the general pressure and wind systems of the world. The northern continents are big enough to change the normal world wind systems more profoundly.

In connection with this influence on the climate a further point to notice about the northern continents is that they extend into the Arctic circle, while the southern continents do not stretch into the Antarctic circle. Thus the northern continents are in direct contact with an area of intense cold and this is bound to affect their climates.

Their greater size and their contact with the Arctic will consequently cause the northern land-masses to experience much greater variations in climate—not only greater variations as from place to place, but also greater variations from season to season. The comparatively simple climatic types found in the northern continents will to some extent be replaced by more complex types, but the controlling factors will be the same and the general principles of climatic control dealt with in Chapter III will still be the same.

In North America the structure lines run mainly north to south so that climatic influences are comparable with the southern continents, and the study of this continent follows on quite easily from that of South America, with which comparisons frequently suggest themselves.

Ice and Ice Action

In Chapter I, ice was mentioned as one of the tools used by nature in sculpturing the surface of the earth. In the southern continents the influence of ice action was only to be found in certain mountain areas, and therefore it was of little importance. In the northern continents, however, with their direct contact with the cold areas of the Arctic circle, and with their much greater areas lying in latitudes experiencing low temperatures, ice action has played a large part.

The ice that has played such a big part in sculpturing the earth's surface has been formed from the compression of snow by its own weight. This process can be seen going on to-day in the higher mountain areas and in the cold region where all the moisture falls in the form of snow. From the snowfields thus formed ice is forced outwards in the form of sheets and tongues, which move slowly outwards till they reach warmer areas where they melt. In the mountain regions these tongues of ice move down the valleys and are known as *glaciers*. In the polar region, in addition to the glaciers of the mountain areas, there are also vast *ice sheets* covering much of the surface of the land.

During the long history of the world the temperatures have fluctuated, and during periods of low temperature the ice sheets from the polar regions have spread over areas which normally are not influenced by ice.

A series of such movements took place comparatively recently in geological history, after the shape of the land-masses was much as it is now, and these glacial epochs have left many marks in North America, Europe and Asia, marks which may be literally seen upon the rocks, and marks in a less literal sense on the life of the areas affected.

Signs of ice action.—As the ice moved over the surface of the earth it went forward with tremendous power and very little was able to resist it. As a result one of the chief signs of the passage of an ice sheet is the comparative *smoothness of rock surfaces*. Harder rocks were able to resist the ice to some extent, but even the outstanding hard rocks were smoothed and rounded, and in many areas

there are to be found *rounded boulders* (often known as "*roches moutonnées*").

During its passage over the surface the ice sheet had boulders embedded in its under surface and these made scratches upon the rocks. Since they were held fast in the ice they naturally made *parallel scratches*.

Unlike water, which only runs downhill, ice may move uphill and thus, in areas where the rock surface varied in hardness, the ice sheet was able to scoop out hollows. Hence in areas of rather hard rock which have been denuded by ice there are many *lakes*, large and small, dotted over the surface, the lakes having formed in the hollows scooped out by the ice.

Among mountains the ice has moved as glaciers. In the higher parts, where the snow collected and the ice formed before it moved out and down, big *armchair-shaped hollows* known as "*cirques*" have been formed.

As the glaciers moved down the valleys which had been formed by the rivers they scooped out these valleys. The normal shape of a river valley is like a broad *V*, but the glaciers scooped out broad valleys with steep sides and flat floors, which are known as *U-shaped valleys*. Flowing down into the bottom of the old river valleys were small streams which flowed in little tributary valleys. The glaciers cut across these tributary valleys and now they are seen as notches in the steep sides of the *U-shaped valleys*, and from them tributary streams enter the main valley by means of waterfalls or, if much erosion has taken place, by a series of rapids. These tributary valleys which thus come suddenly to an end are known as *hanging valleys*.

In addition to the boulders carried along embedded in the ice, vast quantities of *débris* were borne along on the surface of the ice, particularly in front of the ice sheet. Such piles of rock fragments on the surface of an ice sheet are known as *moraines*. The moraine at the front is known as a *terminal moraine*. In the case of glaciers *lateral moraines* are found along their sides, and where two glaciers have come down valleys which unite, and so have formed one glacier, a *medial moraine* has been formed. During the various

stages of the glacial epochs the position of the front of the ice sheet varied considerably, but whenever an increase in warmth caused the front to retreat polewards the terminal moraine was left behind and formed a pile of rock fragments across the area. So big were the terminal moraines of the ice sheets of the Ice ages that to-day they form ranges of *morainic hills* across the plains of North America and Europe.

Apart from the morainic deposits big isolated boulders were often carried by the ice and, when the ice melted, these were left behind. Such boulders are very noticeable as they are naturally of very different rock from the area in which they are found. Such isolated boulders—of which there are many examples in England—are known as *erratics*.

When the glaciers retreated up the valleys the terminal moraines were left behind to form natural dams across the *U-shaped* valleys, and these dams led to the formation of lakes in the valleys. Such lakes are usually long and narrow and so are frequently known as *ribbon-lakes*.

When the ice melted the water formed big lakes and on the floor of these lakes sedimentary rocks were deposited, which, after the draining of the lakes with the final disappearance of the ice, have formed layers of fertile soil. Rivers flowing out of the ice sheet have also spread fertile soil over large areas of land. The commonest form of glacial soil is *boulder clay*. Thus, although the ice has in some places removed soil and in others left the soil strewn with boulders and so made it difficult to work, it has yet made many regions richly fertile.

North America

Build.—North America lies entirely north of the equator, the mainland, usually regarded as lying north of the isthmus of Tehuantepec, stretching roughly between 15° N. and 70° N, while longitudinally it lies north-westwards from South America.

The main structure lines run from north to south, and, though an atlas map suggests three main physical regions, comprising

Western Highlands, Central Lowlands and Eastern Highlands, reference to Fig. 64 shows that there are really four areas. They can be mentioned briefly here, more detailed treatment being left till the regional work is considered.

The northern area is usually known as the *Laurentian Shield*, or sometimes the *Canadian Shield*. It is an area of very old hard



FIG. 64. THE STRUCTURAL DIVISIONS OF NORTH AMERICA.

rocks which has been exposed to much erosion, and particularly to glaciation, so that it is now comparatively low. It is lowest in the north-east, round Hudson Bay, and has a steep edge north of the St. Lawrence.

To the south of it lie the *Great Lakes*, which are the remnants of a much larger lake formed during the ice ages. These drain to the sea by the St. Lawrence river, but their height above sea-level prevents natural navigation (see Fig. 82).

The Eastern Highlands.—Stretching along the east coast, and with a general direction from north-east to south-west, are a series

of old and worn down highlands. The main block of old mountains has been worn down till it forms a low plateau known as the *Piedmont Plateau*, which, north of Hudson river, has been much eroded by glaciation. To the west sedimentary rocks were folded up against it and now form the *Appalachian Mountain* system and the *Allegheny Plateau*. The one main gap through this upland region is formed by the *Hudson-Mohawk* river gap, which was formed by the outflow from the Great Lakes when their natural outlet via the St. Lawrence was blocked by the ice sheet.

East of the highland area lies the east coast plain, which starts near the mouth of the Hudson and gradually becomes wider to the south, eventually sweeping round the end of the system and linking up with the central plains. In the north sinking has led to the formation of the big estuaries of the *Delaware* and *Chesapeake* Bays.

To the south-east is the peninsula of *Florida*, which is a big area of limestone similar to the Yucatan peninsula that lies practically opposite to it.

The Western Highlands.—Stretching along the west coast from Alaska southwards is a vast highland area which has a complicated structure, for it is an area of fairly recent uplift with a good deal of faulting and igneous intrusion, so that there is no uniformity of rock formation.

The main part of the vast system consists of two roughly parallel series of mountain systems. On the east, overlooking the central plains, are the *Rockies*, and to the west lies a series of mountain ranges, chief of which are the *Sierra Nevada*, the *Cascades*, and the *Coast Ranges* of British Columbia. Between these two systems lies a series of *inter-montane plateaus*.

To the west again lies a lower coastal range, which to the north has sunk to form the islands of British Columbia, and between this and the main system lies a trough, forming a strait in the north and a valley in the south.

The Central Lowlands.—The area in between the three upland areas already dealt with is occupied by the more or less undisturbed sedimentary rocks of the central lowlands. The main drainage is to

the Gulf of Mexico by the *Mississippi* river system, but the northern portion is drained to the Arctic by the *Mackenzie*.

The western portion, known as the *great plains*, overlooks the rest of the area, often being separated from it by a distinct scarp. The north has been considerably glaciated, and morainic hills and glacial soils are found, while the southern area is made up of alluvium from the *Mississippi*.

EXERCISES ON CHAPTER XIX

1. Draw a sketch map to show the physical divisions of North America; and write a short account of the chief features of one of these divisions. (O.S.C.)

2. What are the main results of glaciation?

3. Define the following: moraines, cirques, erratics, hanging valleys, inter-montane plateaus.

CHAPTER XX

CLIMATE OF NORTH AMERICA

THE climate of North America is controlled by several factors depending upon its position and build. The area lies entirely north of the equator, extends into the Arctic circle, and is broadest in its northern latitudes. Its main climatic features will therefore be determined by influences from cool areas.

Its build is such that the mountains, running north and south, act as barriers to any very great influence from its bordering oceans, while the absence of any marked east to west barrier allows the broad area in the Arctic circle to play an important part.

Another very important factor in the climate of the greater part of the American continent is the influence of cyclones.

Cyclones.—In these days of wireless weather reports such phrases as “trough of low pressure”, “depression” and “secondary disturbance” are becoming well known. They are all names of pressure conditions and weather controls associated with *cyclonic activity*, and in order to understand the climates of North America (and of the northern land-masses as a whole) it is essential to have

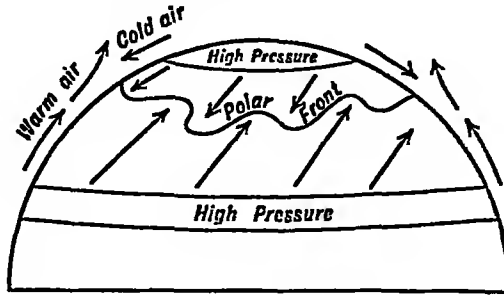


FIG. 65. THE POLAR FRONT—THE
"BIRTHPLACE" OF CYCLONES.

some understanding of what is meant by cyclonic activity. Briefly, a cyclone is a localized pressure system, within the big world pressure systems, in which the low pressure is in the centre. As a result, in the northern hemisphere, winds blow in from the surrounding higher pressures and take an anti-clockwise direction. The air in the centre, being at low pressure, has a tendency to rise.

The cause of cyclones is not definitely established, but they are undoubtedly connected with the meeting of air currents. In Fig. 19, which shows world pressure and wind systems, it will be seen that north of the northern high pressure belt air is blowing outwards to form the westerly winds, and from the Pole winds are blowing southward. These winds meet in an area of low pressure. The winds from the Pole are cold while those from the high pressure belt are warm, and so they rise over the colder winds from the north. The line where these winds meet is known as *the Polar Front*. Owing to the big land-masses of the north, with their changing temperatures, the relative influence of the two high pressure areas (Tropical and Polar) constantly changes, so that the Polar Front fluctuates. Along the line of the Polar Front are set up the pressure conditions known as cyclones.

Since the chief wind direction in this area is from the west, the cyclones move in an easterly direction, and as they move they bring with them cyclonic weather conditions. In the front of the cyclone the winds are mainly from the south, and so warm moist conditions prevail. The centre of the cyclone has warm air at low pressure, so upward air currents lead to rain. Behind the cyclone are cold air

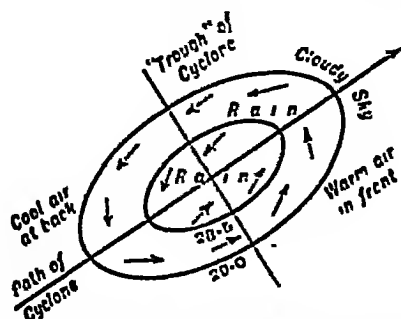


FIG. 66. DIAGRAMMATIC REPRESENTATION OF A TYPICAL NORTHERN HEMISPHERE CYCLONE.

currents from the north, and these bring colder conditions though rain is still common.

A true cyclone may be a thousand miles across, so that even though a place is in its path, all these conditions may not be felt. Apart from true cyclones, there are other types of pressure formation which bring similar conditions. The commonest is the *Secondary disturbance*, which may be likened to a bubble of low pressure in the high pressure rim of the cyclone, and which brings a short period of steady rain in its passage.

Cyclones follow quite regular paths, making use of any natural gaps there may be in their passage over land areas. In North America they cross the continent from west to east, mainly coming from somewhere in the Puget sound area and swinging south round the Great Lakes, sometimes nearly as far south as the Gulf of Mexico, and generally leaving somewhere between the St. Lawrence and the Hudson-Mohawk gap.

In Europe the chief tracks are along the north-western seaboard,

across England into the Baltic, and north of the Pyrenees into the Mediterranean.

It should be borne in mind that cyclones are most common in winter, when the sea is warmest compared with the land and when there is a really big difference in temperature between the Polar areas and the tropical high pressure regions.

Temperature.—The most striking feature in the temperature maps of North America is the big range that is found in the centre of the land-mass, shut off as it is from any tempering sea influence.

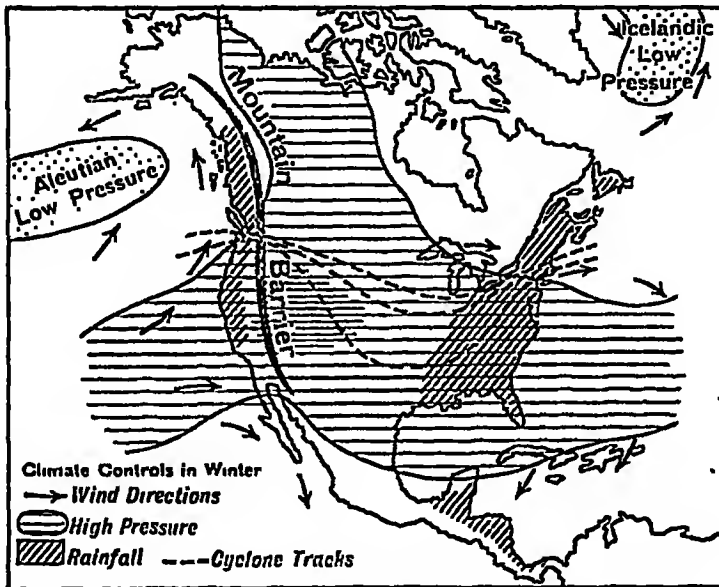


FIG. 67. CLIMATIC CONTROLS OF NORTH AMERICA IN WINTER.

In winter the isotherms take a great bend southward over the cold land-mass, and actual temperature maps show that a large area as far south as 45° N. is below freezing point in January.¹ A narrow area west of the mountain barrier shows the influence of warm winds from off the Pacific, while the east coast is colder than the west, for the main winds come from the west and so reach the east coast

¹ Cp. London (lat. $51\frac{1}{2}^{\circ}$ N.) Jan. Temp. 38° .
July " 64° .

from over a cold land-mass. The narrow portion of the continent—Mexico and Central America—is mainly within the tropics, and the principal modifying influence is that of altitude on the plateau, while the West Indian islands are naturally under maritime influences.

In July the isotherms bend northwards and the interior of the continent is hot. The west coast is modified by winds from the sea, which now is comparatively cool, but the east coast is again similar to the interior.

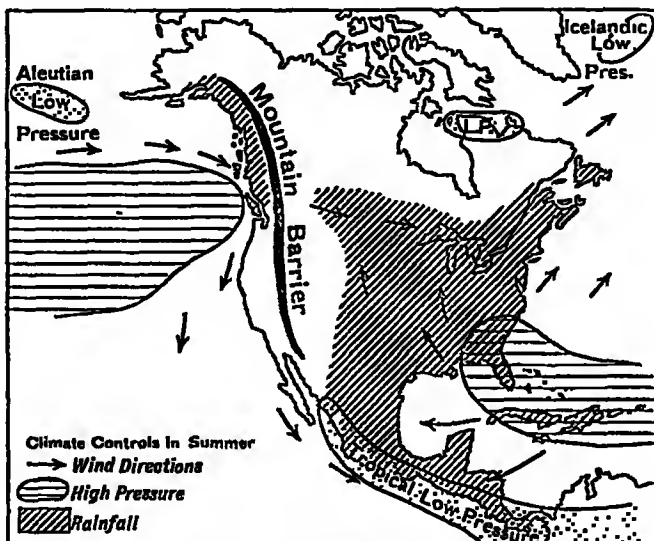


FIG. 68. CLIMATIC CONTROLS OF NORTH AMERICA IN SUMMER.

Seasonal temperatures, and particularly in the interior and during winter, are liable to decided fluctuations owing to the passage of cyclones, with their warm winds in the front and their cold winds behind. The cold "northers" that come in the rear of cyclones cause big falls in temperature and these often do great damage in agricultural areas.

Rainfall.—The controlling influences of the North American rainfall can be seen in Figs. 67 and 68. In winter the land-mass is

mainly a high pressure area, so that rain is only experienced on the west coast, where it is influenced by the Aleutian low pressure system, and in the east where rain is brought by cyclonic disturbances. Central America receives regular relief rain from the North-East Trades. In summer the land-mass is a low pressure area while the high pressure is over the sea. The west coast still has rain from the westerlies, but this is confined to a smaller area. The interior receives more rain as winds are able to blow inland, the main winds swirling inland from the high pressure area over the West Indies. Much of the rain of the interior falls in heavy convectional showers brought about by the heating of the land surface. Large areas of the inter-montane plateaus are shut off from any rain-bearing wind either from east or west, and so are areas of considerable aridity.

Climatic areas.—The size and extent of the continent give North America a great variety of climatic regions. The principal climatic

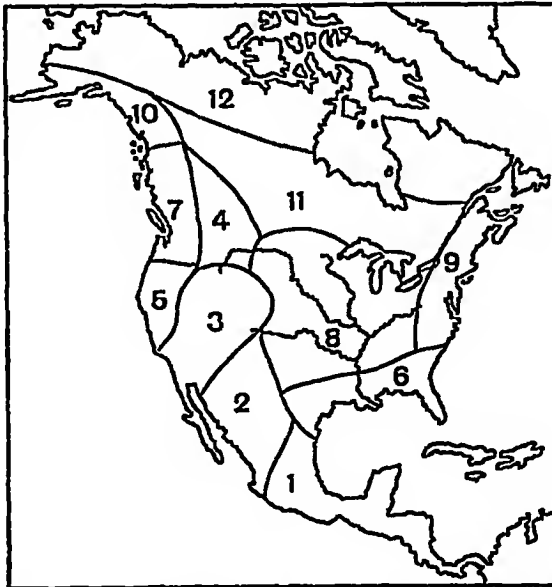


FIG. 69. THE CLIMATIC REGIONS OF NORTH AMERICA.

divisions are summarised below, the numbers corresponding to the map of climatic areas (Fig. 69), while those in brackets refer to the climatic regions of the world—to which reference should be made.

1. Tropical Eastern Margin (A 2).
2. Tropical Interior Area (A 3).
3. Desert.—Partly hot desert, but the mountain areas have a sufficient range of temperature to be classed as cold desert (A 5 and A 5c).
4. Rocky Mountain Area.—Largely a region of low rainfall and moderate temperatures. In the north cyclonic activity brings rainfall in autumn and spring.
5. Mediterranean (B 1).
6. Warm Temperate Eastern Margin (B 2a). This has very heavy rainfall and in summer winds are blowing inland almost like monsoon areas.
7. Cool Temperate Western Margin (C 1).
8. Interior (C 2).—This has very big temperature ranges, and the main points to remember are that summer rainfall comes from winds blowing inland from the Gulf of Mexico, and that in winter it has a fair amount of rainfall (or snow) from cyclonic activity. A simple statement of its climate is that annual rainfall and mean annual temperature decrease and temperature range increases according to distance from the Gulf of Mexico.
9. Cool Temperate Eastern Margin with cyclonic activity (C 3a).
10. Cold Western Margin.
11. Cold Interior (D 2).
12. Arctic Coastlands (E).

EXERCISES ON CHAPTER XX

1. Describe and account for the climate of the Mississippi basin.
2. Compare and contrast the two Americas under the headings (a) build, (b) climate.
3. Contrast the climate of California and Florida.
4. What part do cyclones play in the climate of North America?

CHAPTER XXI

VEGETATION AND PEOPLES

STRETCHING as it does from Tropical to Polar regions, and containing such a variety of climatic types, North America displays a great variety of vegetation. Only a few parts of it have a really heavy rainfall, but, since such a large area of the continent lies in cool regions, lower rainfall is sufficient for plant growth so that the continent is mainly one of good vegetation.

Forests.—*Tropical forests.*—The main areas of tropical forest are to be found in the narrower portions of the continent, particularly in Central America. The plateau build of this area, however, introduces altitudinal vegetation zones, and the three typical zones found in the Northern Andes are once again to be met with, viz. *Tierra Caliente*, mainly consisting of forested areas; *Tierra Templada*, with grasslands and more temperate trees; and *Tierra Fria*, where the vegetation is definitely poor. In areas of poorer soil and lower rainfall in parts of Mexico, particularly in the north-west of the Yucatan peninsula, there are big areas covered with thorn forest similar to the Caatinga of Brazil. Apart from Mexico and Central America the only region of tropical forest is found in Florida, where there are the big swampy forests known as the *Everglades* (part of which has recently been made a huge National Park) as well as mangrove swamps round the coasts.

Temperate forests.—Under this heading may be included both the broad-leaved forests of the deciduous type and the many coniferous areas. They are found in the areas along the east and west where the rainfall is sufficient for tree growth, and in the north where the low temperature offsets the smaller rainfall.

Along the western mountain slopes, where rainfall is heavy, are the richest forests of the North American continent, thick forests con-

taining magnificent trees such as the famous *Douglas Firs* of British Columbia. In the areas of lower rainfall on this coast there are forests of smaller conifers. It is interesting to note that even in the areas of low rainfall among the inter-montane plateaus, the slopes of the mountains are usually forested—an example of the importance of relief in influencing rainfall.

In the eastern area there are three principal types of forest. In the cold north-eastern area is a region of coniferous forest, which is natural in a region of cool temperate eastern margin climate. South of that, where cool temperate slowly merges into warm temperate, is an area of deciduous forest similar to that which once covered the British Isles. Further south again, where the southern Appalachians give place to the coast plain, is a region of light soil which is occupied by more coniferous forest—though the conifers here are of a different origin. It is this last area which is one of the world's big areas for the supply of turpentine. Much of this eastern forest area has been cut down. Stretching across the north of the continent, in the area of the cold interior type of climate, is one of the world's big forest zones. It contains coniferous trees and despite its size only a few types of tree are to be met with. Southward it either merges into the eastern or western forest areas or gradually thins out to give place to the grasslands which occupy the areas where increasing warmth makes the rather low rainfall insufficient for tree growth. Northward the trees diminish in size, gradually giving place to bush and scrub and finally to the wastes of the Tundra.

Grasslands.—The interior of the continent, with its big seasonal variations of temperature and seasonal rainfall, is not suited to tree growth and it forms one of the big grassland areas of the world. Travelling westwards over the Appalachians the diminishing rainfall causes a change from forest to a rich meadowland interspersed with tree growth. Gradually the trees thin out, and the true *prairie* land of the interior is reached. Two main types of grassland are found in the interior plains. To the east of a line which runs approximately along 100° W. the soil is rich and black and the grasses are tall. West of this line the soil is light and brown in colour and the grasses are short. The dividing line is mainly one of rainfall, the difference

in the soil being partly due to the increased fertility brought about by greater rainfall and the consequent richer supply of vegetable matter or humus in the soil.

Regions of poor vegetation.—In the inter-montane plateaus, which are shut off from most sources of rain, the vegetation is of a semi-desert character. Coarse grasses and leathery bushes in regions of poor rainfall give place to the many varieties of cactus in the areas of pure desert which are to be found on the borders of Mexico and the U.S.A. In parts of the mediterranean area the typical evergreen scrub of such climates is to be found, and in this region it is known as *Chaparral*.

In these areas the higher mountains are areas of rainfall and hence there are opportunities for irrigation, and in many places these have been utilized. Apart from these areas of poor vegetation caused by the lack of moisture, there is the large area of the north where the *tundra* is found, a region of poor vegetation because of a lack of heat and light. During the long days of mild summer sunshine the Arctic shorelands are covered with mosses, lichens, and small plants of that type, but soon the land is covered with a layer of snow that will only melt for a short part of the summer, while the ground is never thawed more than a foot or so below the surface.

North America: its Peoples and Development

The natives of North America.—Although nature may be said to have been generous to North America in so far as vegetation is concerned, once again man had no animal which he could usefully domesticate, a fact which is rather overlooked in the consideration of the people who inhabited the continent at the time of its discovery by Europeans.

Within the continent may be distinguished three principal groups of natives. In the north, living in the most forbidding part of the continent are the *Eskimos*—one of the most magnificent examples of the way in which man is able to live by moulding his life to suit his environment. Their snow *igloos* in the winter and their skin tents in the summer are the only possible houses for such climatic conditions. Similarly their diet of seal blubber is essential to life in such a climate,

and in the use of bones and skins for the manufacture of their tools and weapons and their remarkably seaworthy canoes or *kayaks* they reach great heights of ingenuity. Nevertheless, they lead a very miserable existence and much relief work is being done for them by the Danish Government in Greenland, by Grenfell in Labrador and by the Canadian Government. Their lot is being improved by the introduction of reindeer herds.

In the forests and grasslands of the main part of the continent lived the so-called *Red Indian*. They were a splendid example of a virile hunting race, living almost entirely by the chase—their freedom of movement illustrated by their skin *wigwams* and birch bark canoes, their virility displaying itself in fierce tribal wars and in the pursuit of the bison, the big animal of the plains. There was a plentiful supply of animal food, for the continent had quite a large variety of bird and animal life, so that only a few of the tribes practised agriculture to any extent. Unfortunately, like many races who lived in areas to which European settlers went, they succumbed first to the white man's rifle and then to his diseases, so that now only a few remnants of the once proud tribesmen are to be found living in the reservations provided for them by the races who have taken their lands.

Apart from the hunting Indians, there were tribes in the western mountains who adapted themselves to life there. In the north-west were tribes who lived to a large extent by catching the salmon of the rivers, while in the arid plateaus of the south-west were tribes who learned to irrigate small patches of land and grow crops in regions apparently quite unsuitable for native life.

When the Spaniards landed in Central America they found the plateau of Mexico to be the home of a native civilization, which they later found had a counterpart in Peru. The *Aztecs* of Mexico were another race of people who had learned to irrigate and cultivate a mountain region, and who had cities and temples of amazing splendour. Even they had forerunners, for in the heart of the Yucatan peninsula, lost for ages among its jungles, are found the remnants of temples and cities of a lost race—the *Mayas*—whose history is as yet only guessed at.

The growth of modern North America.—While it is impossible to study fully the fascinating story of the opening up of North America, a brief outline is essential. After the discovery of the continent by Columbus came the voyage of Cabot to the north, but little settlement took place for practically a hundred years, although big fisheries developed round Newfoundland.

There were three main centres of settlement. The *Spaniards* occupied the larger West Indian islands and conquered the Aztecs of Mexico and eventually penetrated up the western mountains to California. On the whole they were for long mainly concerned with the development of mineral wealth, and it must be remembered that during the period of the opening up of North America the old time greatness of Spain was declining.

The *French* opened up the river entries of the continent, primarily the St. Lawrence estuary, a region whose exploration was due to the endeavours of navigators like Cartier and Champlain to find a north-west passage to the Pacific.

The *English* and *Dutch* settled the coastal areas between the Appalachian and the sea, though very soon the Dutch area came into British hands. Much of the settlement of this region was by bands of people seeking freedom for their own particular views. The colonization of the south, which soon became based on the production of tobacco as a cash crop, led to the introduction of negro slave labour.

During the first half of the eighteenth century there was a long struggle for supremacy between the French and English ; the French trying to use their control of the river entries to confine the English to the sea coast, the English trying to break their way outwards and westwards. The long struggle had hardly culminated in a victory for England, which led to the annexation of Canada, before the original English colonies broke away to form the United States of America. The new country that was thus born became the new home for all those people who, for one reason or another, found life in Europe not to their taste, and there followed a century of expansion. The last French area, Louisiana, was purchased from Napoleon and pioneers spread westwards to the Rockies and beyond them, the Indian

lands being taken by conquest or treaty. The old Spanish areas of the south-west were captured from the new republic of Mexico, Alaska was bought from Russia and the present area of the United States grew up. Canada remained British, occupied by the old French settlers, by loyalists who would not join the revolting colonists, and by new immigrants from Britain.

EXERCISES ON CHAPTER XXI

1. If you were given a number of photographs and told that they were of typical forest areas in (a) Eastern Canada, (b) British Guiana, how would you be able to determine to which of the two each photograph belonged? Account for the differences mentioned in your answer. (O.S.C.)

2. Which of the "new continents" (the Americas, Africa, Australia) seems to be the best endowed by nature?

3. Why has North America developed to such a great extent as compared with South America?

4. Compare the life of the "Red Indians" with that of the grassland dwellers of Africa.

CHAPTER XXII

TROPICAL NORTH AMERICA AND THE WEST INDIES

Mexico

Position and build.—The chief portion of this country consists of the narrow southern end of the main North American continent from the Rio Grande to the Isthmus of Tehuantepec, but it also includes the *Yucatan Peninsula*. It thus lies largely between latitudes 15° and 30° N., and so is nearly bisected by the Tropic of Cancer.

Although at first sight the country appears to consist of one large plateau, its build is hardly as simple as that. Stretching south from the U.S. border is a large plateau, some 6,000 feet high, bordered on the west by the *Sierra Madre Occidentale* and on the east by the *Sierra Madre Orientale*. From about 20° N. to the Isthmus of Tehuantepec is a region of valleys and small inter-montane plateaus separated by high ridges containing many volcanic peaks, of which the chief is *Popocatepetl*. East of the low isthmus is the limestone plateau of Yucatan. The coast plains are comparatively narrow and are considerably broken up by spurs from the mountains bordering the plateau. The peninsula of *Lower California* is a continuation of the coast ranges of the U.S.A., and the Gulf of California is a sunken area between this range and the mainland which is slowly being filled in by sediment brought down by the Colorado River.

Climate and vegetation.—Mexico gives an excellent illustration of the influence of altitude on temperature; for the three mountain zones of *Tierra Caliente* (hot lands) up to 3,000 feet, the *Tierra Templada* (temperate lands) 3,000-7,000 feet, and *Tierra Fria* (cold lands) above 7,000 feet are well marked.

Rainfall is very much determined by relief. The east coast which is influenced by easterly winds all the year—really the North-East Trades—has rain all the year round, but has most in summer when the

winds are chiefly south-east or east. The plateau has low rainfall coming in summer, the surrounding mountains acting as a barrier to most of the rain-bearing winds. The west coast is dry in winter when the winds are off shore, but the low pressures of the land-mass in summer give local on-shore winds which bring some rain in the summer months—only a few inches in the north but becoming heavier towards the south.

The eastern coastlands and those of the south-west are regions of thick forest, but this becomes thinner up the slopes. The plateau has a poor vegetation, cactus being a predominant feature. The north-west coast is practically a desert. Yucatan is largely covered with tropical forest or thorn forest.

Development.—In such a country uniform development is impossible. As is the case in much of Latin America, the main centres of development are in inland regions where altitude mitigates an otherwise tropical climate.

The "Tierra Caliente" of the coastlands has hardly been touched

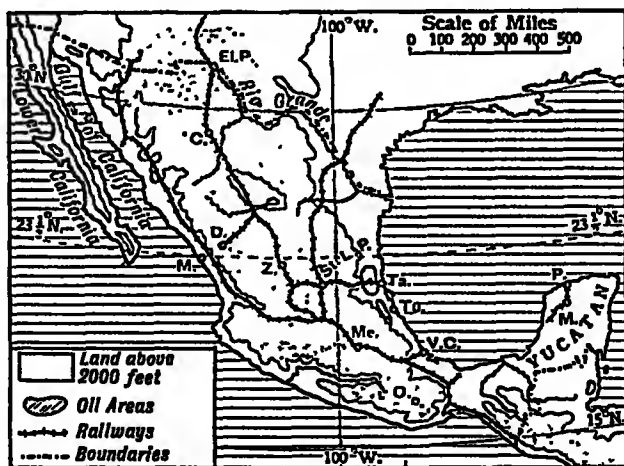


FIG. 70. MEXICO.

Identify the towns marked.

from an agricultural standpoint. The eastern regions along the Gulf have some plantations of *cacao* and *coffee*, but the southern coast regions are still mainly forested.

In the plateaus the rainfall is not evenly distributed. The region of valleys and plateaus round Mexico City is the main centre of population. The chief food crop is *maize*, which is grown in the Tierra Templada. The upper portions of this belt and the lower Tierra Fria are used for pasture lands for *sheep* and *goats*—*cattle* being found chiefly in the maize areas.

In the northern plateau rainfall is usually insufficient for agriculture, but small areas of irrigation are being opened up, growing *maize*, *sugar* and *alfalfa*. The main irrigated region, however, is in the north-west, linked up with the U.S. irrigation scheme for the lower Colorado valley.

The most important cash crop of the country is found in Yucatan, in the rather drier north-western part of the peninsula, from which area come large supplies of *sisal hemp* from the "henequen" plant. The centre of this industry is *Merida*—the hemp being shipped chiefly from the port of *Progreso*.

Minerals.—The Spanish conquerors of Mexico were attracted to the country partly by the signs of mineral wealth it possessed. It has always been noted for its *silver* and even now produces nearly half the world's supply. The silver is mined in the northern plateau and in the Sierra Madre Occidentale. The main centres are *San Luis Potosi*, *Zacatecas*, *Chihuahua* and *Durango* (which has also big *iron* deposits). In connection with the silver mining there is also a considerable production of *lead*.

Gold is becoming more important and is mined chiefly in the south near *Mexico City* and *Oaxaca*.

More important than all these metals in recent years have been the big supplies of *oil* obtained from wells in the east coast region. The fields are situated quite close to the sea and for a time Mexico was the second largest producer in the world, though she now takes a rather lower place. The chief oilfields are behind the ports of *Tampico* and *Tuxpan*.

Railways and towns.—Communications in such a country will not be easy. The main railway lines are those running southwards from the U.S. border and those connecting the inland centres with the east coast. There are three main lines south from the U.S.A.

One runs along the east of the plateau via *San Luis Potosi* to *Mexico City*, another from *El Paso* along the west of the plateau to link up with the first and the third along the west coast, through *Mazatlan*—the chief western port, and then joining the other two to the capital.

The chief port is *Vera Cruz*, which serves the area around Mexico City and has a railway across the isthmus of Tehuantepec. *Tampico* serves the oilfields and the silver mines. Both these eastern ports are very exposed and are rather roadsteads than harbours. The capital, *Mexico City*, is built on the site of the old Aztec capital, in the chief of the inter-montane plateau regions in the centre of the country. It has a good central situation and is as near being a natural route centre as is possible in such a country, so that it is the main focus of the rail system.

Central America and the West Indies

These two regions are taken together owing to similarities of climate and production and, to some extent, of build.

Build.—The West Indies stretch in a great curve from off the mouth of the Orinoco to the peninsula of Yucatan. The smaller islands stretching from *Trinidad* northward to *Puerto Rico*, which are known as the *Lesser Antilles*, are the upstanding portions of a fold which runs northward from the South American continent.

From Puerto Rico westwards the big islands known as the *Greater Antilles*—*Hispaniola*, *Jamaica* and *Cuba*—are the upstanding remnants of mountain systems that link up with the highlands of Central America. These mountain chains are well marked by the two west-facing peninsulas of Hispaniola and the Sierra Maestra of South-eastern Cuba.

Central America really includes all the land between the isthmuses of *Tehuantepec* and *Panama*. Between these two there is another low dividing point near *Lake Nicaragua* and the *San Juan* River. North and south of this the region contains plateaus, with a high volcanic western edge, while the coastal plains on both sides are comparatively narrow.

Climate.—The entire area is in the trade wind belt throughout the year. The islands have some modifying influence from the sea,

while in Central America the plateau areas are the chief regions of habitation. Since rain is brought mainly by trade winds the eastern side of this region receives the heaviest rain, and in the islands there is a considerable difference in climate between windward and leeward sides. The region is particularly liable to *hurricanes*, a type of intense tropical cyclone, which frequently lead to damage and loss of life.

Most of the surface is naturally forested, but much land has been cleared for cultivation of tropical crops.

Development.—The first part of the New World to become known to the Old World, the region round the Spanish Main, shows considerable complication in its political development. The mainland is occupied by six small republics, *Guatemala*, *Honduras*, *Nicaragua*, *Salvador*, *Costa Rica* and *Panama*, the U.S.A. area of the *Canal Zone*, and *British Honduras*. Of the islands, Cuba and Hispaniola have independent States in the republics of *Cuba*, *Haiti* and *San Domingo*, all three of which, however, are practically dependencies of the U.S.A., of which country *Puerto Rico* is a territory. *Jamaica* and most of the Lesser Antilles are British, and there are a few French and Dutch islands.

Broadly speaking, the colonial areas are much more developed than the independent States.

Productions are chiefly confined to tropical plantation products. In Central America the main wealth is derived from *coffee* grown on the slopes in the plateau regions, but only Salvador and Costa Rica produce enough to play any part in world markets. Apart from this the natives rear *cattle* on the cooler plateau areas and grow *maize* and *manioc* as subsistence crops. British Honduras produces considerable quantities of tropical *hardwoods*.

The West Indies have three main crops. *Sugar* was the original crop of the islands and is still the most important crop in Cuba, which produces nearly a third of the world supply, and in Puerto Rico and some of the small islands, such as Trinidad and Barbados. *Tobacco* is a big product of Cuba and Puerto Rico and to a lesser extent in Jamaica. *Fruits* are important. Jamaica is the chief *banana* producing country in the world, enormous quantities of this fruit being sent in steamers with special holds to Europe, U.S.A. and

Canada. It was the idea of taking passengers on these fruit boats from New York to the West Indies that started the "pleasure cruises" that are such a popular feature of modern shipping. Jamaica also grows *citrous fruits*—*oranges* and *grape fruit*—while *limes* come

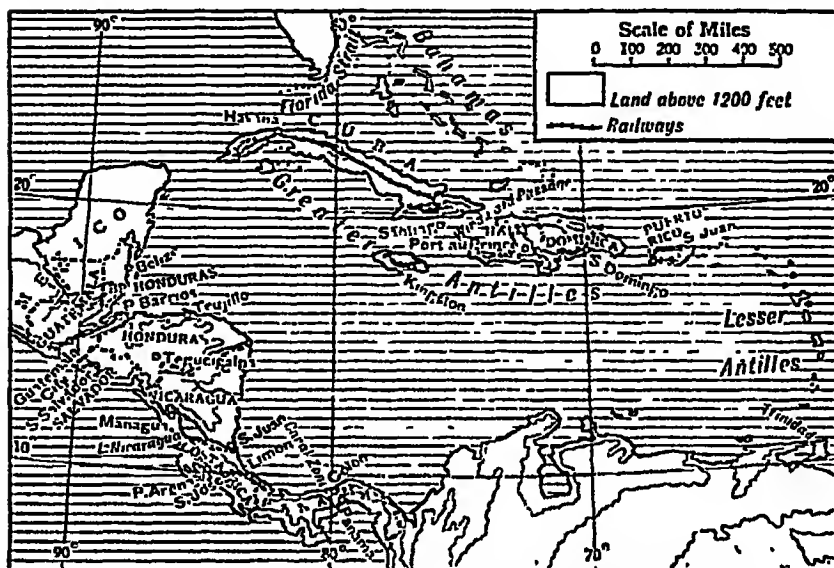


FIG. 71. CENTRAL AMERICA AND THE WEST INDIES.

Note the position of Jamaica between the Windward Passage and the Panama Canal.

from the small islands of Dominica and Montserrat. The Bahamas are noted for *pineapples*.

The only minerals that need to be mentioned are *iron* from Cuba and the *asphalt* and *oil* which are obtained from the apparently endless source of the famous "pitch lake" of the island of Trinidad.

Towns.—In Central America there are two main types of towns—the bigger centres of settlement on the more habitable plateau lands, and the ports which are perforce situated in the comparatively unhealthy lowland coastal plains. In all the republics the only railways are those connecting the capitals with one or more of the

ports. These capitals and ports are shown on the map of the region (Fig. 71).

The trans-isthmus route provided by the San Juan River and Lake Nicaragua should be noted, for this was regarded as a possible site for an inter-ocean canal—a project which is revived from time to time.

In the islands the only towns of any size are ports. *Havana*, the capital of Cuba, is a big and important town in an important position for traffic into the Gulf of Mexico and to New Orleans.

Kingston in Jamaica has acquired a very important route position in the Caribbean Sea since the opening of the Panama Canal.

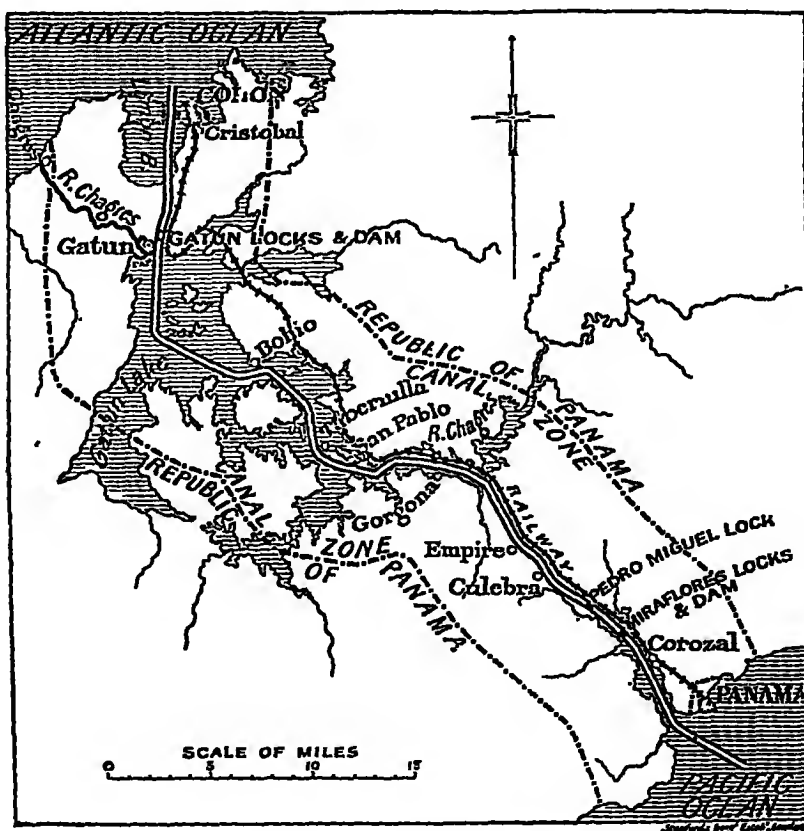


FIG. 72. THE PANAMA CANAL.

The Panama Canal

The narrow isthmus of Panama, even in the earliest days of the Spanish conquest, was regarded as the possible site for an inter-oceanic canal. After his successful construction of the Suez Canal, de Lesseps turned his attention to this area, but the hilly backbone of the isthmus, and the diseases engendered by the tropical climate, defeated his project. After the Spanish-American war, the U.S.A. took up the project. A strip of land, ten miles wide, was bought from the newly-formed Republic of Panama and the two problems were tackled in earnest. Medical science showed how to defeat disease by getting rid of the swamps in which the fever-carrying mosquitoes bred. The river Chagres was dammed to form the Gatun Lake, with a surface 85 feet above sea-level, reached by the Gatun locks. This, and the Gaillard cut (originally the Culebra cut), seven miles long, overcame the hilly backbone, and the canal was opened in August 1914. It is just over 40 miles long from shore to shore, though the dredged channels at either end make its true length some 51 miles. It is 41 feet deep, and so can take the largest vessels. The average passage takes seven or eight hours, but the locks limit the number of vessels that can go through to some 50 a day. The canal has been of tremendous importance in bringing the west coasts of the Americas thousands of miles nearer, by sea, to New York and Europe, and it also provides the shortest route from the British Isles to New Zealand. Its importance is shown by the figures for 1935, when 5,180 vessels used the canal and paid nearly five million pounds in tolls. Of these vessels 2,143 were American and 1,170 were British.

EXERCISES ON CHAPTER XXII

1. Select any three important exports from the West Indies to Great Britain. Where is each produced, and what geographical conditions favour its productions? (C.S.C.)
2. Give an account of British Honduras under headings (a) relief, (b) climate and vegetation, (c) occupations and trade. (C.S.C.)
3. Write a description of the fruit growing industry of the West Indies, emphasizing the geographical factors. (C.S.C.)

4. Agriculture has not played much part in the economic development of Mexico. Why is this? Is it likely to do so in the future?
5. What are the various causes that have led to the prosperity of the Caribbean areas during the course of its history?
6. Draw a map of the world and mark on it the routes to the west coasts of the Americas, Australia and New Zealand, and the Far East, that use the Panama Canal.

CHAPTER XXIII

THE UNITED STATES OF AMERICA—I

Growth of the country.—Within the 150 years or so since they broke away from British Rule, the original thirteen States that combined to form the United States of America have grown to forty-eight, occupying half a continent and having a population of some 120 millions of people. In order to understand many aspects of modern U.S.A. some of the big factors in the growth of the country must be mentioned.

There was a great expansion westward from the original colonies, an expansion which opened up first the rich plains of the centre and later the fertile valleys of the West, though the original attraction of any great numbers to the West was the quest for gold, and so there was a gradual shift of population westwards. The opening of the West may be said to have culminated in the building of the Union Pacific Railway (1861-69).

The 1860's were also the culmination of another phase of America's story. There had always been a certain amount of cleavage between north and south, for the northern settlements were mainly Puritan in origin, the southern mainly Royalist. This difference was accentuated with the employment of coloured slave labour in the south, which developed an almost feudal outlook as compared with the republican tendencies of the north. The differences came to a head

in the Civil War—fought over the question of slavery—a fierce struggle that unfortunately left a bitterness for many years. In the end the north abolished slavery, although it could not end the economic dependence of the south on the tobacco and cotton crops which made cheap labour essential.

The vast areas that were opened up to new enterprise offered a home for a very big population, and there flocked to the new country a steady flow of immigrants from the Old World—immigrants seeking refuge from either economic or political conditions in Europe. So, apart from English settlers, there arrived Irish and German immigrants and then, at the end of last century, an increasing number from Eastern and Central Europe, but the new country seemed able to absorb them all and turn them into good citizens. However, during the Great War the U.S.A. feared that the end of the war might lead to a too big influx of refugees from Europe, and immigration laws were established that limit not only the total number of immigrants for any year, but also the number of any particular nationality that is allowed to enter.

This human background should be borne in mind when considering the present development of the country.

Build.—The chapter on the build of North America gives an outline of the build of the U.S.A., but it is now necessary to consider it

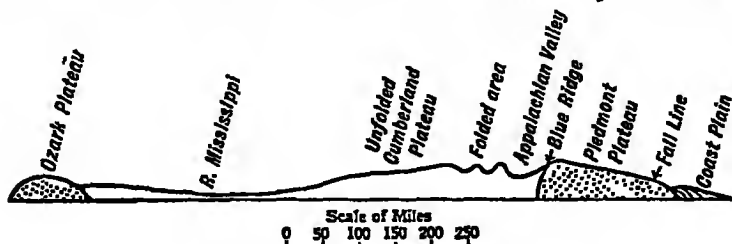


FIG. 73. THE BUILD OF EASTERN U.S.A.

Illustrated by a section inland from Norfolk (Va.) to longitude 95° W.

more fully. The country is easily divided into three big divisions—Eastern Highlands, Central Plains, and Western Highlands.

The Eastern Highlands.—There are three elements in the structure of the Eastern U.S.A. and these can be seen on Fig. 73.

First of all is the *Coastal Plain*, which is made up of young sedimentary rocks formed from the older areas to the west of it. The layers of these sedimentary rocks were formed on the shore line of the Atlantic, and the layers outcrop in lines roughly parallel to the coast, the harder layers forming "scarps" which face inland, with gentle "dip slopes" facing seaward. The Coastal Plain is broadest in the south and diminishes in width to the north, where the sinking of the



ss = scarps or escarpments
dd = "dip" slopes

FIG. 74. SCARPLANDS.

Scarps are formed where layers of comparatively hard rock outcrop in regions of sedimentary rock in which the strata are tilted.

land has caused it to be cut up by the estuaries of *Chesapeake* and *Delaware Bays*. There is no true coastal plain north of *Long Island*.

The second element is the *Piedmont Plateau*—the worn down remnant of an old mountain system. It consists of hard rocks covered with a thin layer of younger material, and slopes from west to east, the western edge of it forming a fairly well marked ridge, generally known as the *Blue Ridge*. Where it joins the younger rocks of the coast plain there is a fairly big change in level forming a line of waterfalls and rapids, and so giving it the name of the *Fall Line*. In the north the ridge has been subjected to considerable glacial erosion, and it is lower and, among other signs of ice action, there has been considerable removal of soil. This area of glaciation lies north of the *Hudson-Mohawk Gap*—which was broadened into such a big trough by the overflow of the great lakes during one period of the ice ages. North of the Hudson the main point to notice is the way in which the erosion of softer rock has led to the north to south *Connecticut* valley, lying between the *Green Mts.* and *White Mts.* This north to south formation has proved a big hindrance to communication inland from the coasts of New England.

The third element consists of sedimentary rocks which have been pushed up against the west of the old rocks of the Piedmont. The

Blue Ridge overlooks a broad valley known as the *Appalachian* valley, which runs from the Hudson valley south-westwards, and which is of importance for transport. Beyond this lie a series of ridges and valleys, also running in the same direction, which have been formed by the erosion of the soft rocks in an old folded system, thus leaving the hard rock areas upstanding. These ridges and valleys are a decided barrier to transport from east to west. Beyond these ridges and valleys are the *Allegheny* and *Cumberland* plateaus, formed from practically unfolded sedimentary rocks.

Rivers in this area tend to flow along the structure lines and then either break through to the Atlantic, as in the case of the *Potomac*, *Susquehanna* and *Delaware*, or westward to the *Ohio*, which cuts a deep valley across the plateau areas.

The Central Lowlands.—At first sight there would appear to be a simple plain area stretching between eastern and western highlands, but actually the vast interior lowlands of the country have several important subdivisions.

In the north, round the south of the lakes, there is an area showing several signs of glaciation. Two of the most important are the presence of lines of *morainic* hills and the formation of rich soil areas. The most important rich soil area is found in the valley of the *Red River*, and this extends northwards into Canada.

The area lying immediately round the south-west of Lake Superior is part of the old rock area of the north.

The southern part of the area, known as the *Gulf Plains*, can be regarded as the continuation of the Atlantic coast plain. The lower valley of the *Mississippi* is a big alluvial area. Between the northern plain and the Gulf Plains, to the west of the Mississippi, are the *Ozark Plateau* and the *Ouachita Highlands*, which are areas of older rocks folded up above the younger materials of the plains.

To the west lie the *Great Plains*, which in many places have a steep rise from the eastern lowlands, and which slope gradually up to the eastern foot of the Rockies. Even those plains are not uniform in structure. In the north the *Black Hills* of Dakota thrust their way through to form a rather unfertile area, while in Nebraska and South Dakota are the *Bad Lands*, where a poor climate and poor soil combine

to give an arid area, and in the south a bed of porous limestone gives rise to the relatively poor soil of the *Staked Plains*. Nearly the whole of this vast interior is drained by the Mississippi and its big tributaries, chief of which is the *Missouri*, which is navigable by small boats to *Great Falls* at the foot of the Rockies. The *Arkansas* and the *Red Rivers* also drain the Great Plains area, but the only important tributary from the eastern plains is the *Ohio*.

The Western Highlands.—The main structural features of the Western Highlands of North America are very clearly marked in the U.S.A. where they reach their greatest width. These divisions—Rockies, Inter-montane Plateaus, Western Cordilleras, trough and coast ranges, are shown on Fig. 75.

The "*Rockies*" is the general name given to a series of ranges and plateaus that rises out of the Great Plains, and which acts as a watershed for the Mississippi drainage and the rivers flowing westwards to the Pacific. The whole system is broad and includes high valleys and plateaus and several areas which have been preserved as national parks—chief of which is the *Yellowstone National Park*, which includes many examples of volcanic activity.

West of the Rockies lie the great *inter-montane plateaus*, of which there are three in the U.S.A.

In the south, drained by the Colorado and its tributaries, lies the *Colorado Plateau*. The rocks are here horizontal, and the region is comparatively dry. These two facts have combined to cause its characteristic feature—the *canyons*. Rivers which derive most of their water from the higher and wetter mountain areas flow across the horizontal rock beds and cut deep troughs for themselves. The varying hardness of the rock has led to the cliff-like side of the canyons—of which the most famous is the *Grand Canyon*, some 217 miles long and 6,000 feet deep. Faulting has also led to the formation of big tablelands and deep valleys. The bigger tablelands are known locally as *mesas*, the smaller ones as *buttes*.

North of the Colorado Plateau lies the *Great Basin*. This is a big depression between the *Wasatch* Mountains to the east and the *Sierra Nevada* to the west. These mountains were once connected, but the intervening area faulted and collapsed forming a series of

ridges and basins which in many cases became lake beds. The basins became filled in with rubbish brought down from the moun-

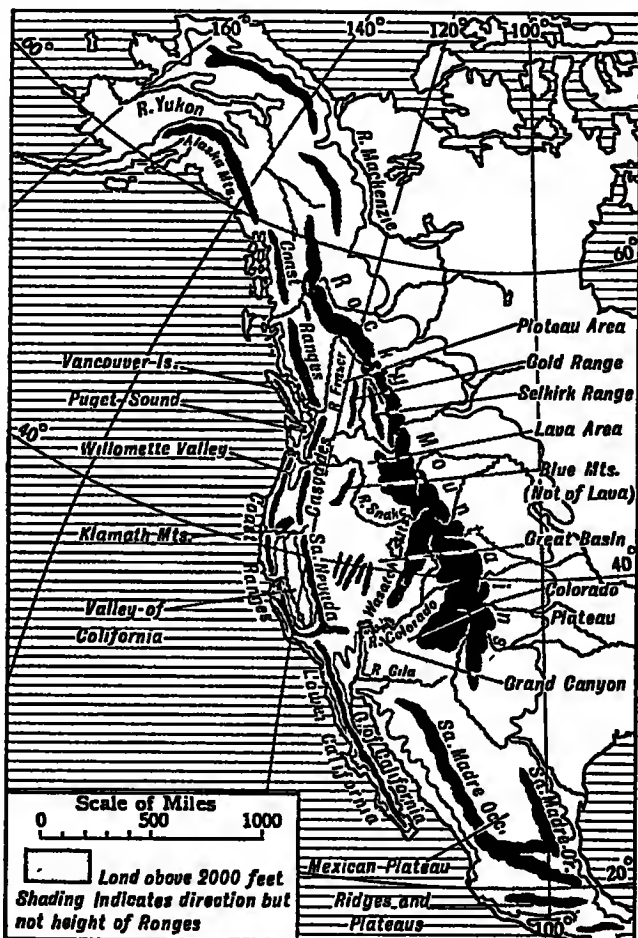


FIG. 75. THE STRUCTURE OF WESTERN NORTH AMERICA.

tains, the lakes evaporated and now there only remains one of any size, the *Great Salt Lake*, which is now very shallow. The whole basin is a comparatively arid area of inland drainage.

North of the great Basin is the region drained by the *Snahe* and *Columbia* Rivers, which break through the western mountains and reach the Pacific. This region, lying between the *Cascade* Mountains to the west and the Rockies to the east, is a region of volcanic material, for nearly the whole area has been covered with vast sheets of lava, now, of course, much weathered.

The *western* edge of the inter-montane plateaus is marked by a line of highlands forming the *Sierra Nevada* in the south and the *Cascades* in the north. These mountains are on the whole made of quite old rocks and their structure is complicated.

Along the Pacific coast runs a chain of lower and younger mountains generally known as the *Coast ranges*.

Between these last two mountain ranges is a depression forming two important valley areas. In the north the depression forms the *Puget Sound*. South of this there is a valley which is occupied by tributaries of the *Columbia*, and these tributaries—the *Willamette*

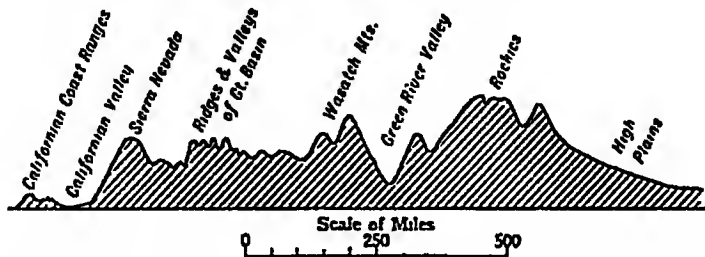


FIG. 76. SECTION ACROSS THE WESTERN HIGHLANDS OF THE U.S.A. ABOUT LATITUDE 38° N.

Vertical scale is the same as that used in Fig. 73.

and *Cowlitz*—cause the region to be known as the *Willamette-Cowlitz* valley.

In the south, between the *Sierra Nevada* and the coast range, lies the great *Californian valley*, drained by the *Sacramento* and *San Joaquin* Rivers, which break through the coast range at the *Golden Gate* forming the entrance to *San Francisco* harbour.

The two valleys are separated from one another by the *Klamath* and *Siskiyou* mountains. The *Californian valley* has been built up of material brought down into it by rivers flowing down the boundary ranges.

Where the rivers have deposited the materials over the floor of the valley they have spread them out in big *alluvial fans*, so that the valley has not a continuously level floor.

Climate and Vegetation

There is no need to consider these in any more detail than has already been done. Reference to Fig. 69 will show that in the U.S.A. there are six main climatic areas :

- (a) A mild cyclonic area in the north-west (No. 7).
- (b) A more extreme cyclonic area in the north-east (No. 9).
- (c) A mediterranean region in California (No. 5).
- (d) An arid area in the Western Highlands (No. 3).
- (e) A sub-tropical and warm temperate area in the south-east (No. 6).
- (f) A large area with a summer rainfall, big temperature ranges and a tendency to sudden temperature changes in the centre (No. 8).

The vegetation map shows forest both on the east and the west, but it should be remembered that the eastern forests have been to a large extent cleared, and that the main sources of timber are now towards the west. Much careless deforestation has taken place, leading to soil erosion, and the problem of re-afforestation and timber supply is one which promises to cause the U.S.A. considerable trouble unless it is dealt with in the near future.

EXERCISES ON CHAPTER XXIII

1. Compare the eastern and western areas of the U.S.A. under the headings (a) build, (b) climate.
2. Write notes on the following : Scarplands, the Great Basin, the Californian valley, the Atlantic Coast plain.
3. What facts of structure explain the differences between the sections shown on Figs. 73 and 76?

CHAPTER XXIV

THE UNITED STATES OF AMERICA—II

Occupations and Productions—Farming

THE original settlers on the east coast, especially in the New England area, found a region somewhat similar to the lands which they had left. They were thus able to develop a farming life similar to that of Europe and to grow European crops. The warmer areas further south were not so suitable for this type of farming, but colonists there developed new crops, cotton and tobacco, with the aid of coloured labour. The eastern areas, however, were not perfect for farming. The climate was quite good but in the north the glaciation had left much denuded rock surface and had littered much of the soil with boulders. The coastal plains further south had many sandy areas and many swampy districts, while the rivers flowing across them made communications rather difficult.

With the pacification of the Indian tribes, settlers were able to penetrate into the interior by the Hudson-Mohawk Gap in the north and by the Kentucky route in the south. The fertile interior plains, with their vast areas, were opened up just as the beginning of industrialization created a demand for foodstuffs for Europe and for the industrial areas that grew up in New England. The farmers of the east could not produce these foodstuffs as cheaply as their competitors on the lowland plains, and so many of the eastern farms were left to go derelict while the younger generations followed the old timers' advice of "go west". In such a vast country it was cheaper to go elsewhere and acquire new land rather than buy fertilisers for soils that were becoming exhausted.

Apart from these important factors of American farming there is one other point that must be borne in mind before considering details of U.S.A. farms and crops. It is a new country, and like

many new countries, one of sparse population as compared with its size. As a result farming is concerned with producing as much as possible per man, rather than as much as possible per acre, which is the aim of farmers in older countries of more dense population.

Eastern farming areas.—As reference has just been made to the movement away from the original eastern farming areas, it is easier to deal with the present development of that region first, before going on to discuss the crops of the larger plains area. For reasons that will be dealt with later, much of the industrial development of the U.S.A. has taken place in the north-east, while the position of that coast with regard to the Atlantic trade routes has led to the main ports of the country being situated upon it.

These facts have determined the present agricultural developments of the area. Wheat and similar foodstuffs can be carried long distances, but towns must obtain their supplies of milk, fresh fruit, and vegetables from areas as close at hand as possible—areas within a few hours transport distance. This has led to two big types of farming in the eastern area—dairy farming and truck farming. Much of the land lying in and around the Hudson-Mohawk-Gap is given over to the production of milk, butter, etc., for New York and other big neighbouring towns.

Truck farming is the name given in the U.S.A. to the production of fruit and vegetables which are sent to supply the big towns. As fruit and vegetables are considerably affected by quite small soil and climatic changes, it is usual for particular areas to specialize in one or two products—a specialization which is of further value, as marketing is more easily controlled. Thus Maine is noted for potatoes, Connecticut for onions. Maryland for tomatoes and small fruit.

Fruit growing—particularly apple growing—is carried on in the Hudson-Mohawk, Piedmont and Appalachian valley area, in districts rather too far from the cities for successful dairy farming, or in places where valleys give particularly suitable conditions. In connection with the fruit and vegetable growing, great canning industries have sprung up, particularly at Baltimore.

South of Delaware bay the region is rather far from the cities for such development, and this area is given over to *tobacco growing*.

Truck farming is also carried on in Florida. This is on account of its much warmer climate, the vegetables from Florida reaching the northern cities in winter and early spring, and ceasing to be profitable as soon as production commences further north.

The farming areas of the Central U.S.A.—Apart from the regions mentioned above, the main farming areas of the country are to be found in the central plains, where the climate, it will be remembered, tends to vary according to distance from the Gulf of Mexico. This climatic control, in conjunction with certain soil controls, is shown by the distribution of the various types of farming within this vast area.

The mixed farming belt.—Immediately south of the Great Lakes is a region of mixed farming, *i.e. general farming*, aiming at the production of crops and dairy produce, and with an increasing tendency to dairy farming. This is brought about by three principal causes. The soil is not always fertile, for it is an area of old rock heavily glaciated and having its soil in patches, as in the case of New England. It is in the heart of the continent and has a long cold winter with only a short growing season, so that wheat crops would not always ripen, with the result that it has proved easier to grow hay and root crops for cattle. Maize is grown but, as it cannot ripen, it is cut green and stored in *silos*, or big storage chambers, the silage being used by the farmer for cattle food in the winter. The lakes have a modifying influence on the climate of the land just near them, and in these milder areas fruit is grown.

This type of farming has been encouraged by the fact that this region is well situated to supply the needs of the industrial areas of the community.

Wheat: the spring wheat areas.—Although wheat will grow under many conditions, it grows best in areas of fertile and fairly clayey soils which have periods of warm sunshine following a sufficient rainfall to cause the wheat to swell out into its full ear. In the upper Mississippi valley and in the valley of the *Red River* these conditions are fulfilled. This region was once covered by a great ice age lake (known to geologists as *Lake Agassiz*) and the floor of

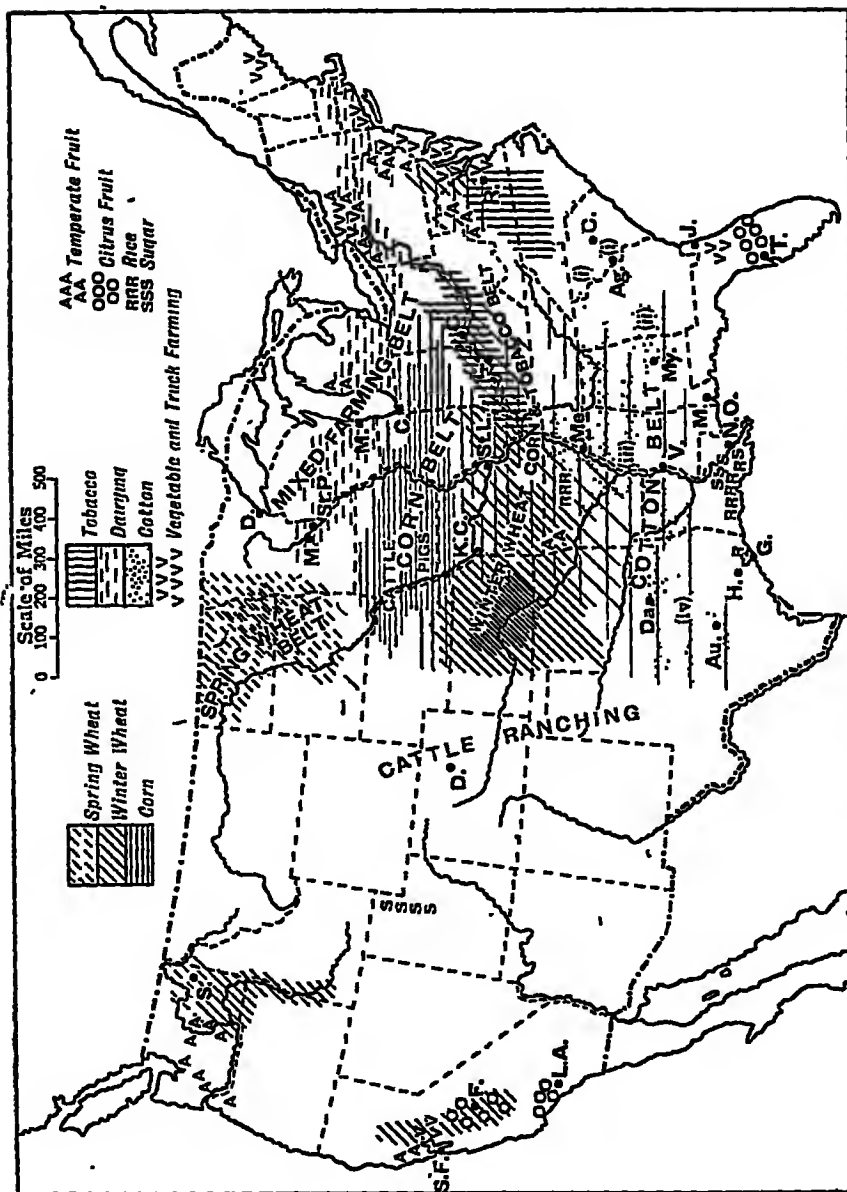


FIG. 77. FARMING IN THE U.S.A.

Thickness of shading indicates relative importance. Numbers on cotton centres indicate regions of production referred to in the text. Towns indicated should be identified.

this old lake is now marked by fertile soils. This region receives a sufficiency of rainfall—between twenty and thirty inches annually—and this rain comes in with the inblowing winds during the early summer. As it is in the heart of the continent the winter is very cold, but this helps the farmer by breaking up the ground and killing off grubs.

The wheat is sown as soon as possible in the spring, and special types are used that will ripen in the short time available. The late summer and autumn are usually hot and dry, so that a fine hard wheat is produced. This is one of the big wheat producing areas of the world (especially when its extension into the adjoining area of Canada is considered) and much wheat is shipped eastwards from the Lake ports of Duluth and Milwaukee, sometimes in the form of flour from the mills of Milwaukee itself or from Minneapolis, the central town of the area. This area sometimes suffers from the cold snaps which affect the interior, and then a late frost in spring may kill the growing corn, or an early frost in autumn may spoil the crop before it can be harvested. This danger, and recent low prices for wheat in world markets, have caused the farmers of this area to begin to develop more mixed farming, with dairying or something similar as an alternative to the wheat.

The winter wheat areas.—In regions of a milder winter—such as in the British Isles and north-west Europe—wheat is sown in the autumn and is protected in the winter by a light snow cover. This enables the wheat to have long enough to ripen during a comparatively mild summer, or alternatively, to ripen early if the region is one with a hot summer. In the U.S.A. there are two main areas of winter wheat. One of these is not in the central plains area, but in the west, on the fertile soil made by the erosion of the volcanic material in the valleys of the *Columbia* and *SNAKE* Rivers. Even in this area the more northerly farmers grow spring wheat rather than winter wheat. The other area of winter wheat is situated between the latitudes of the *Missouri* and *Arkansas* Rivers in the states of *Kansas* and *Nebraska* where the winters are milder, and the summers hot enough to enable the wheat to be reaped in June or July. This area lies to the drier western side of the Mississippi.

The maize or corn belt.—Important as is the production of wheat in the U.S.A. the most important grain crop of the country is maize, or as the American farmer calls it, *corn*. It is grown practically all over the central plains, except in the west when the rainfall is too low, though it does not ripen in the north but is used, as has been seen, for silage. Although it has such a wide distribution there is one area in which corn is the staple crop. This is the region just south of the spring wheat belt, covering practically the whole of the states of *Iowa, Illinois* and *Indiana*, and extending westwards into part of *Nebraska*. The western limit is due to a deficiency of rainfall, while in the south other crops play a more important part. This area has deep rich glacial soil, and the summer is long enough and hot enough to ripen the maize—which requires a growing period of about four and a half months without frost, and a midsummer temperature of about 80° F., as well as comparatively heavy summer rain. An interior area, with its rain coming in short but heavy convectional showers, fulfils these conditions.

The corn itself is not much used as a cash crop, but it is used to fatten cattle and pigs which are sold to bring in the necessary money for the farmers' wants. Cattle are brought into this area from the cattle ranching areas on the drier western plains, and after being fattened they are sent to the stockyards at *St. Louis* and *Chicago*, where they are sold to the big meat packing firms. Chicago is the biggest meat packing centre in the world. Pigs are reared on most farms, and help to overcome the shortage of labour by eating the standing corn and getting fat in the process (a method known in America as "hogging down the corn").

Eastwards this belt merges into a mixed farming area, for there are situated many of the big manufacturing towns of the U.S.A.

The winter wheat, corn and tobacco belt.—South of the region in which corn plays such a dominant part, and yet not far enough south for the production of cotton, is an area which has a more diversified crop series, the distribution of the crops being decided by several factors. The principal crops are *wheat, maize* and *tobacco*.

Reference has already been made to the *winter wheat* area to the west of the Mississippi.

In the wetter areas *maize* is grown, but not in such large quantities as in the maize belt proper. This is largely due to the fact that the soil is not so uniformly good. In Kentucky and the valley of the Ohio the chief crop is tobacco, this area being really a continuation beyond the Appalachians of the coastal tobacco area of Virginia and North Carolina, and in this region there is a good deal of coloured labour. The main centres of the tobacco industry are Louisville on the Ohio and Richmond on the coastal plain.

As the wheat and maize crops in this region ripen earlier than those further north, it has been possible for casual labourers to work their way northwards, doing harvest work in each area as they go, and this has been of considerable importance in a land that was, till recently, rather short of labour.

Cotton.—In the southern States of the central lowlands is found one of the major production areas of the world, for this region produces two-thirds of the world's supply of raw cotton. The production of cotton in this area is based on many factors. The introduction of negro slaves made it possible for the landowners to take advantage of the soil and climatic conditions which were so favourable, and in modern times the production of cotton depends primarily on the large supply of comparatively cheap coloured labour, the cotton being grown either on plantations worked by negroes or as the cash crop of negro tenant farmers.

The production of cotton depends primarily on a suitable climate. The essential conditions are a long frost-free period, averaging 200 days, a summer temperature of not less than 77° F., with warm nights, and a rainfall of at least 23 inches, but not more than 60 inches. The temperature requirements limit the northward extension of the cotton belt to the latitudes of North Carolina and Cairo on the Mississippi, the minimum rainfall requirements mean that cotton cannot be grown in the regions west of about 97° W., and the maximum rainfall conditions prevent it from being grown in Florida and on the actual shores of the Gulf of Mexico.

Within this rather large area there are certain definite centres of concentrated production, determined mainly by soil conditions, and four main ones can be distinguished:

(i) In the east is the old area of the coast plain and the Piedmont, in *Georgia* and the *Carolinas*, which is still producing heavily with careful farming.

(ii) In Alabama the *Black Belt* between *Montgomery* and *Columbus* is famous.

(iii) The flood plains of the Mississippi between *Memphis* and *Vicksburg* have rich alluvial soil producing large crops.

(iv) The *Black Prairie of Texas*, round *Austin* and *Dallas*, are now the chief cotton producing areas in the world.

The cotton is taken to local *ginneries* to have the seeds removed, and is then packed in bales and sent to the cotton manufacturing centres of the world. The main cotton ports are *Savannah* and *Charleston* on the Atlantic and *New Orleans*, *Houston*, *Galveston* and *Mobile* on the Gulf of Mexico.

Within the cotton belt there is a certain amount of *maize* production, and this and other crops are now being produced in larger quantities in order to give the soil a rest from cotton, and also because in recent years the cotton crops have been very much affected by the ravages of the *boll weevil*, which has gradually spread northward from the Mexican border.

Rice and *sugar* are grown along the hot wet coastal plains where cotton cannot be produced, the main centre being in the State of Louisiana.

Fruit growing.—With such a large area there are naturally many areas growing fruit of all types.

Temperate fruits are grown in northern areas. *Apples* are chiefly important in valleys among the Appalachians, and the *Özark Highlands*, and in the *Okanagan* and *Yakima* valleys in the Columbia districts in the north-west.

In these valleys fruit growing is assisted by the way in which really cold air sinks to the bottom, leaving the middle slopes comparatively warm at night and thus suitable for fruit. This is known



FIG. 78. THE CONTROL OF CROPS BY "FROST DRAINAGE".

as *frost drainage*. Soft fruits are grown in these areas, and on the milder eastern shores of *Lakes Michigan and Ontario* are important fruit areas producing *peaches and grapes*.

Citrus fruits are grown in two areas. In *Florida* and along the Gulf shores *oranges* and *grape fruit* are important, especially in central Florida.

The mediterranean area of *California* produces an enormous quantity of fruit, and this is particularly due to the fact that irrigation can be carried on. In the sheltered area of Southern California, around *Los Angeles*, *lemons* as well as *oranges* are important, for this region is practically immune from frost, to which *lemons* are particularly susceptible. California also grows other fruits of all types, and these are tinned or dried and exported. There has been much specialization, so that the South Californian valley is the chief *grape* centre, and *San Jose* is a big *plum* growing centre.

Irrigation areas are very important in the west, for the configuration has shut many of the valley areas off from the rain-bearing winds. The surrounding mountains, however, have a higher precipitation and the surplus is used to water the valleys. Apart from the big irrigation schemes serving California, chief of which is that of the Imperial Valley in the very south, there are irrigation centres on the Snake river area, round *Boise*, in the *Carson City* area of the Humboldt valley, round *Phoenix* in the Salt river valley, and best known of all, round *Salt Lake City*. In those areas *alfalfa* is grown to form the basis of cattle rearing, and much *sugar beet* is grown.

Similar irrigation areas are found among the eastern foothills of the Rockies round *Helena* and *Denver*.

Cattle and sheep.—Frequent reference has been made to cattle, both in connection with the dairy farming areas of the north-east, and the meat production of the corn belt. Apart from these areas, cattle are reared in the drier western plains, where, although there may not be as many cattle as there are in the dairying or maize regions, they are yet relatively more important as they are the main source of wealth. The cattle in these western areas are reared in a semi-wild state on large ranches, and are sent into the corn belt for

final fattening for beef purposes. Many sheep are also reared in the drier parts of the plains or the plateaus, but though they are reared primarily for their wool, there are not enough of them to produce all the wool required by the woollen mills of the country.

EXERCISES ON CHAPTER XXIV

1. (a) Show on a sketch map the approximate position of the cotton belt and three exporting ports of the United States. (b) State four geographical conditions favouring cotton growing in the area you have marked. (J.M.B.S.C.)
2. Give a reasoned description of the distribution of the chief crops of the United States between the Appalachian Highlands and the Rocky Mountains. (S.L.C.)
3. Describe the geographical controls influencing crop growth in the Mississippi basin.
4. Explain the reasons for the development of dairy farming and truck farming, showing why they have developed in certain areas only.
5. Contrast the varying types of climate required for fruit growing.

CHAPTER XXV

UNITED STATES OF AMERICA—III

Occupations and Productions—Mining and Manufactures

WITH such a diversity of rock formations it is natural that the U.S.A. should have a wide variety of mineral wealth, and in fact there is only one important mineral which the country lacks—namely, tin. The mining areas are found in or near the highland areas of east and west.

The mines of the west, particularly the gold mines, played an important part in attracting settlement and encouraging the development of transport. The mining areas in the west are rather scattered and they produce a variety of minerals, a summary of which is given below.

Gold is now of small importance. The main producing areas of modern times are in the slopes of the Sierra Nevada in the Sacramento valley, and in the Black Hills of Dakota, while there are scattered mining areas in the states of Arizona, Colorado and Nevada.

Copper—of which the U.S.A. produces over one half of the world's total—is found in three main areas in the west.

In Montana there is a big producing area centred round *Butte*, with smelting works at *Anaconda*.

In Utah it is found south of Salt Lake, the principal centre being *Bingham*.

In Arizona it is mined in the Gila valley and other southern districts, the principal centres being *Globe* and *Bisbee*.

Apart from these western areas copper is also mined in the *Keweenaw* peninsula to the south of Lake Superior.

Lead, zinc and silver are other metals for which the western mountains are important. Lead is found in the *Bingham* area,

round *Leadville* in Colorado, in that portion of Idaho which extends to the Canadian border, and from the old rocks of the Ozark area. Zinc is found in conjunction with lead, particularly around *Joplin* in the Ozarks, and also in the district round *Butte*. Silver is mined with lead in the Idaho and Bingham areas and with gold in *Arizona*, but it is not of any great value at present. These minerals, important as they are, are of small value compared with the three big mineral products that have enabled the U.S.A. to become such a great industrial nation. These three products are oil, coal and iron ore.

Oil.—The mode of occurrence of oil has been mentioned in Chapter XVIII, in connection with the oilfields of northern South America. The U.S.A., however, is the biggest oil producing country in the world, and occupies a predominating position in world trade in oil.

The principal oilfields of the country can be placed in three main groups.

The original producing area was along the western edge of the Appalachian fold system, and oil is still being produced here, mainly in Western Pennsylvania. A good deal of natural gas is found in conjunction with this oil, and this is piped to serve the industrial areas of the region. The oil is sent by pipe-line through the Hudson-Mohawk Gap to *Bayonne* and *Jersey City*.

The main producing field is now found in the south-west of the plains. Really there is a series of fields stretching from *Oklahoma*, west of the Ozarks, to the Gulf shores of Texas. The largest is in *Oklahoma*, stretching northwards from *Cushing*. Other important centres are round *Eldorado* in South Arkansas, and in *Texas*, where it is found immediately behind the coast in the *Galveston* area; some 200 miles further inland, and in the east of the State. In these regions new oil bearing regions are frequently being opened up and the threatened exhaustion of the supplies seems a long way off.

Long oil pipe-lines convey the crude oil from these inland fields to the coast, where it is refined or exported in tankers. The chief oil ports are *Baton Rouge* on the Mississippi, and *Galveston*.

Apart from these big interior fields there are smaller fields scattered along the foot of the Rockies, and in all these fields the oil is of great value for local transport and power purposes.

The third big oil centre is in California. Oil is found in the south of the Californian valley and also in the region between the coast ranges and the sea just to the north of *Los Angeles*. Owing to their isolation from the other U.S. fields and to their position on the Pacific, these Californian fields, apart from their large export, are of great importance.

Coal and the U.S. coalfields.—Although reference was made to coal in connection with the southern continents, those continents contain such comparatively small amounts of it that no particular details concerning it were mentioned.

It is a type of organic rock, having been formed from the remains of plants and trees that lived in the swampy forests during the period now known to geologists as the *carboniferous* age.

These forests consisted of giant tree ferns and the like, growing in a swampy region along the deltaic coastlands of the old continents. As the plants died they sank into the swamp and helped to swell the thick layer of humus from which it grew. Slow changes of level were taking place so that a region at one time covered with swamp sank below the sea and this layer of humus became covered over with sedimentary material brought down by the rivers. As a result it became compressed and hardened. Later the area rose again and a new coal forest grew on this fresh layer of sedimentary material. So the story went on—the level constantly changing till many alternating layers of plant-formed rock and sedimentary rock were piled on top of one another. The age of the coal swamps passed away but their remains were left buried in the earth, getting harder as new rocks were formed upon them, and now the coal is found in *seams* of varying thickness and hardness, with layers of sand and shale between to mark the periods when the area was under the sea.

In the U.S.A. many of the sedimentary rocks that were formed south of the Laurentian area and east of the old Piedmont area were formed during the carboniferous period. As a result there are vast coal seams in the rocks that have been folded and thrust up to make the hills and plateaus of the east. The area of greatest folding has been considerably eroded and there is not much coal found in the actual Appalachian folded system. In the north of it, however,

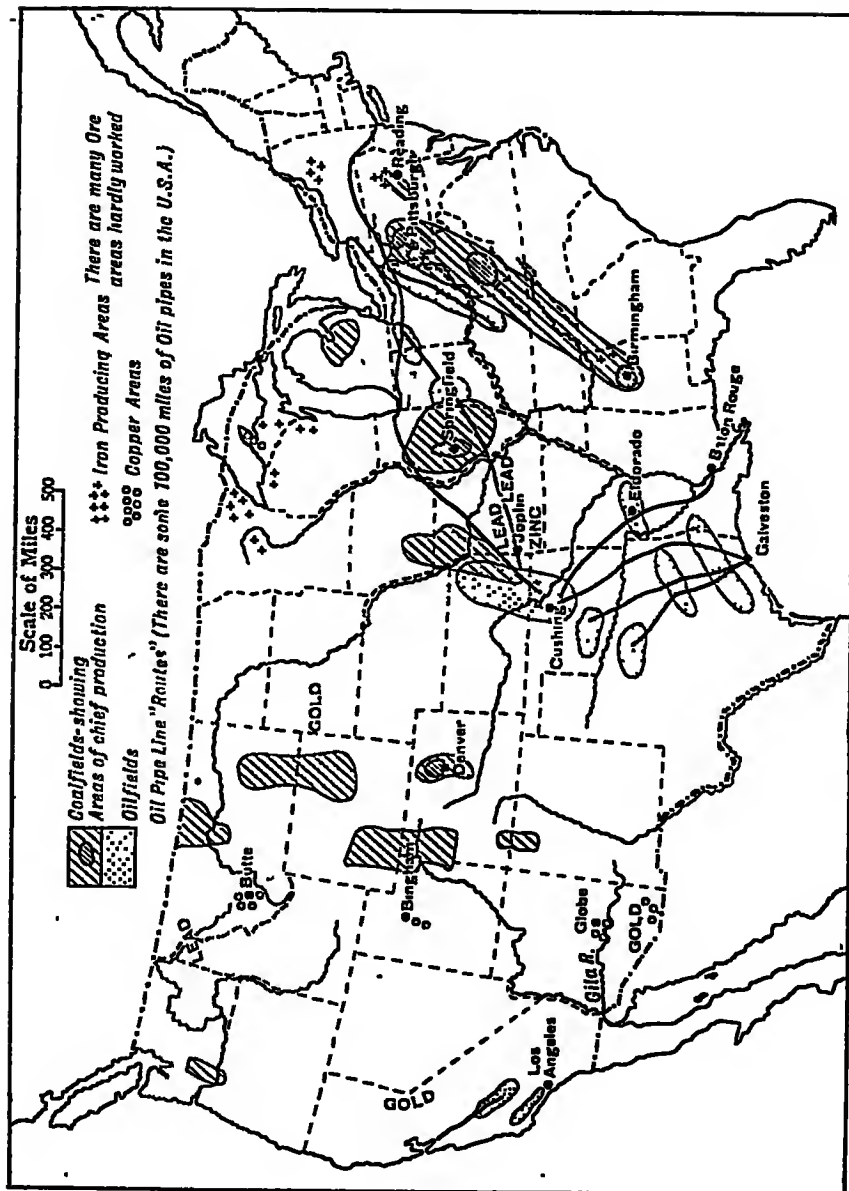


FIG. 79. MINING IN THE U.S.A.

some coal seams have been left—after having been compressed into the very hard form of coal known as *anthracite*. This is mined particularly in the Susquehanna valley and valleys parallel to this in the region behind *Reading*. Much of this anthracite is sold to the big cities of the east for central heating purposes.

The main coal seams occur in the comparatively undisturbed rocks of the plateaus to the west of the ridges. In this plateau the rivers have cut deep valleys for themselves—so deep that they have exposed the coal seams. This has made mining exceedingly easy for shafts have merely to be driven straight into the face of the coal seams. Further, these valleys have a ledge of low land at the foot of the slope and bordering the rivers, so that it has been easy to build railway lines along the valleys, and to have the mining towns and subsequent manufacturing towns near the outlets to the mines.

The only drawback of the American coal mines is that they are rather a long way inland.

There are three main mining centres along the western edge of the Eastern Highlands. The chief mining centres are in the area round *Pittsburgh*, and particularly round *Johnstown*, *Wheeling* and *Connellsville*. Further south, in the south-west of West Virginia, the mining centres are found in the valleys of the Gt. Kanawha and Sandy Rivers, while in more recent years there have been big developments in Alabama near the town of *Birmingham*.

Apart from these eastern fields, which produce about 80 per cent. of the U.S.A. total, the chief field is in the region of *Springfield*, Illinois—the coal here being easily mined and locally valuable as it is able to supply big agricultural areas. There are other scattered fields along the foot of the Rockies and the west coast in the state of Washington, but these are of little real importance.

These coalfields have become the seat of vast industries, and of the American industries the steel industry—and its various engineering branches—is by far the most important. This has been made possible by the supplies of iron ore.

Iron ore.—The original iron working in U.S.A. was carried out with charcoal in regions of iron production in the Appalachian valleys, and later anthracite came to be used for this purpose. A

certain amount was also found in the *Pittsburgh* area and Pittsburgh became the chief iron and steel centre. Now, however, practically all the American iron ore requirements are met by vast supplies from the old rocks lying to the west and south of Lake Superior. The areas producing this iron ore are shown on the sketch map (Fig. 80). The ore is sent eastward by lake steamers and is unloaded along the shores of Lake Erie. Coal is sent as a return cargo from

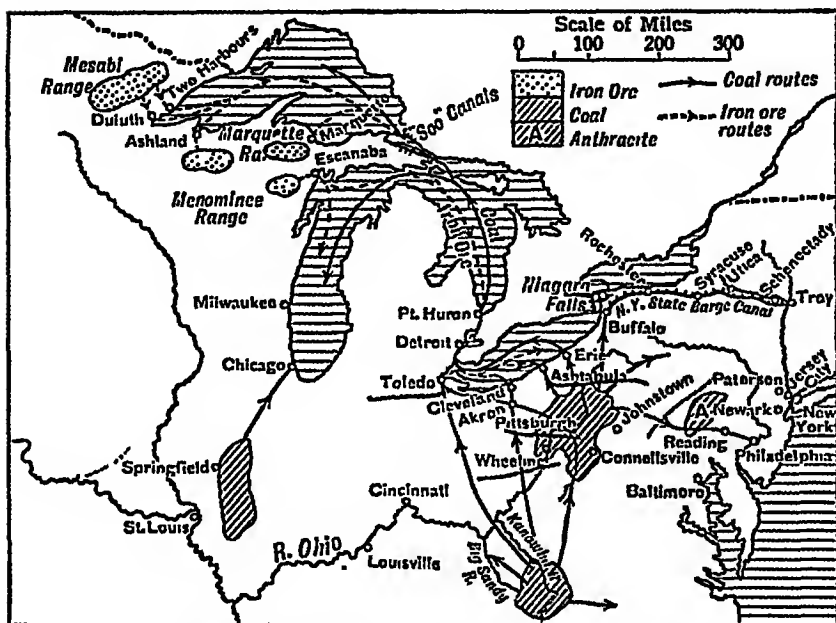


FIG. 80. THE GREAT LAKES IN RELATION TO (i) COAL AND IRON PRODUCING CENTRES, (ii) INDUSTRIAL REGIONS.

the Pittsburgh area; as it is downhill from the coal area to the Lake shore, transport that way is easy, and nowadays a great deal of smelting is done at *Cleveland*, *Toledo* and *Ashtabula*—lake-side ports where the coal and iron ore meet, while coal carried back in the steamers is used for smelting in the area *Duluth*.

Smelting takes place in the *Chicago* area to supply the needs of the agricultural regions.

There is also a good supply of iron ore near the coal of Alabama and this makes *Birmingham*, U.S.A., an iron centre like its name town in England.

Manufacturing in the U.S.A.—Endowed as it is with such vast supplies of valuable minerals, and producing so many raw materials, it is only natural that the country should develop large industries. For the successful growth of an industry certain essentials are needed, namely: power, accessibility to raw materials, a suitable labour supply and a good market within easy reach. The interplay of these factors has led to the location of the main U.S. industries.

The original industries of the country grew up in the regions of original settlement in New England—power being available in the many waterfalls of that glaciated area. Nowadays the power is obtained from certain big hydro-electric schemes or is based upon imported coal. Much of the raw material has to be imported, as it nearly always had to be, and the region has to compete with areas better situated in regard to markets. The skilled labour supply is, however, a big asset. The industries are grouped primarily round the coastal areas. In the *Boston* neighbourhood are big *leather and boot* factories. In this same region, at *Lowell* and *Lawrence*, and extending to the Rhode Island towns of *Providence* and *Fall River* and *New Bedford* are a series of *textile* centres manufacturing *cotton* and *woollen goods*—the cotton now woven being usually fine material in order to avoid competition with cheaper material manufactured in the south. Further west, in the *New Haven* area is a region of scattered *hardware* industries.

The second big industrial region of U.S.A. is to be found along the lines of communication across the Eastern Highlands. At the outlet of the Hudson-Mohawk Gap stands *New York* and the towns of the *New Jersey* coastline. These deal with the traffic that flows through the gap from mines and farms to the east coast. With their own big populations, and those within easy reach through the gap, there have sprung up in these towns and in those strung out along the route a series of general industries designed to supply the manifold needs of such a population, *wool* and *clothes* at *New York*, as well as at *Philadelphia*, which is another “outlet”-town further south, *silk* at

Paterson, locomotives, electrical goods and typewriters at Schenectady and so on. In the valley of the Mohawk these towns have sprung up along the *Erie Canal*, now known as the New York State Barge Canal, which connects the lakes with the Hudson River, and the towns of *Rochester. Syracuse* and *Buffalo*, and others along the canal

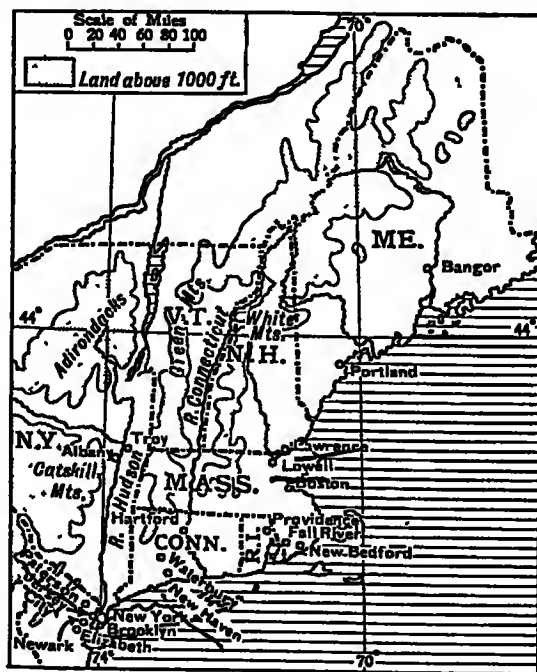


FIG. 81. THE INDUSTRIAL CENTRES OF NEW ENGLAND AND THE NEW YORK AREA.

and near by are further helped by their accessibility to the electricity generated by the Niagara Falls.

The steel towns of the *Pittsburgh* and Lake Erie shores have already been mentioned. Water transport has enabled these latter to develop more heavy engineering. *Chicago* is a lakeside town in easy reach of coal, iron ore and raw materials and it is so centrally situated that it is the manufacturing centre for the maize belt—supplying its

needs for *machinery* and packing its meat for export. In the lakeside group are *Detroit* and its neighbouring *motor* towns, also within reach of Niagara's power.

The *waterpower* of the Fall Line has led to manufactures along the edge of Piedmont, particularly in the cotton belt where, too, the Alabama coalfield gives rise to an industrial region. With raw

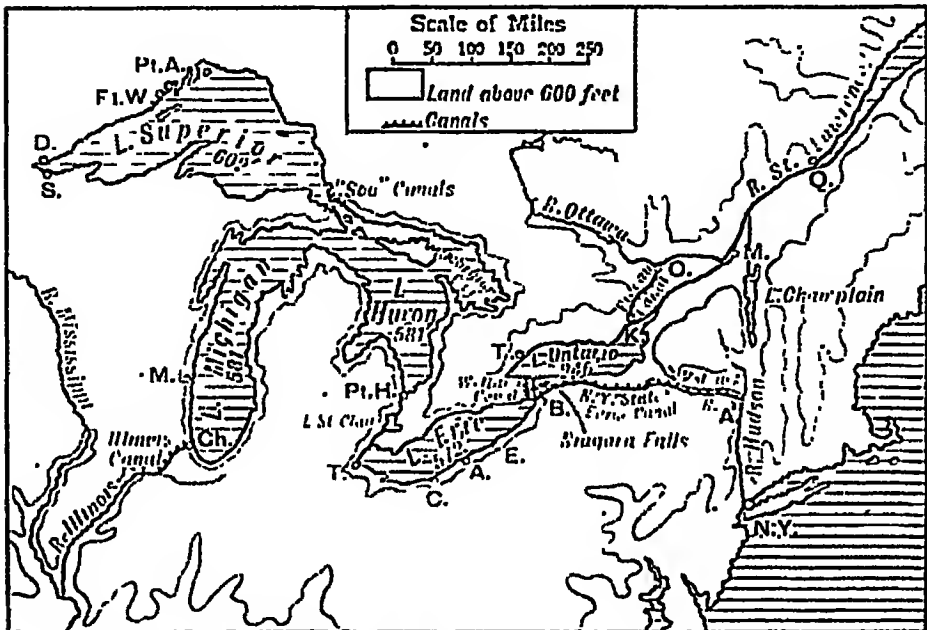


FIG. 82. THE GREAT LAKES AND THEIR CANALS.

The chief lake and sea ports are marked and should be identified. Figures on lakes show heights above sea-level.

material nearer at hand and local labour cheap this southern area has been a severe competitor of New England in recent years.

Apart from these big regions of manufacture there are many scattered manufacturing towns in the country, mainly engaged in supplying some local need or needs which the big centres cannot supply any better owing to distance or inaccessibility.

Transport and communications.—In dealing with such a vast country it is impossible to consider the transport systems in any

detail, but it is possible to notice a few of the more important facts connected with the growth of the transport of the country.

In the first place it has two big natural means of inland transport—the Great Lakes and the Mississippi-Missouri system.

The Great Lakes are undoubtedly of enormous value, both for the eastward movement of grain and iron ore and the westward movement of coal and manufactured goods. They are, however, handicapped by two facts, the different levels at which they are situated, necessitating the construction of canals and locks which limit the size of vessels that can make through trips, and the long period in winter during which they are ice bound. The heights of the lakes and the canals that have been necessary are shown on Fig. 82. Their importance can be realized when it is learned that the *Soo Canals* carry more traffic than the Panama and Suez Canals combined. The Great Lake system is so important because it lies in the heart of the temperate area, and because both its natural and artificial outlets face eastwards towards Europe across the busy North Atlantic.

The other natural waterway of the combined Mississippi-Missouri provides navigation as far inland as *Great Falls* in the State of Montana. This has not been so useful as it would at first appear. The river in its lower course meanders over its flood plain, and navigation is hindered by ever shifting mud banks so that the famous "stern-wheel" boats have been essential. Further, it flows in a north-south direction into the rather out of the way Gulf of Mexico, while most of the traffic tends to have an east-west direction since it is between the big temperate areas of America and north-west Europe. The comparatively recent opening of the Panama Canal has helped to overcome this latter difficulty, but the Mississippi is still mainly used for very slow local traffic.

The U.S.A. has the largest railway mileage in the world, for its surface is covered with a good network of railways linking up the interior with the coasts, and uniting the distant east and west, and north and south. It is only possible to indicate certain main features: The first problem of the railway builder was to overcome the obstacle of the Eastern Highlands. The chief railways make use of the *Hudson-*

Mohawk Gap, but others make use of the fairly easy gaps of the *Susquehanna* behind *Philadelphia* and the *Potomac* behind *Baltimore*. Once across the Highlands the railways focus on the natural route towns of the interior. The biggest of these interior route towns is *Chicago*—a natural meeting point of lake and railway transport. *St. Louis* as a bridging point of the great waterway is also an important centre. The fertile eastern part of the central plains is well served with railways which focus on to several such natural route centres. In the drier west, railway lines become fewer and only a few penetrate the terrific barrier of the Western Highlands. Most famous of these is the "Union Pacific", which, by way of the *Platte River*, *Cheyenne*, *Evans Pass* and the upper valleys of the *Green River*, reaches *Salt Lake City*. From here it now crosses the lake by a bridge, then follows the *Humboldt River* into the Sa. Nevada, descending into the Californian valley via the *Truckee* river valley.

In the north, three lines concentrate on the *Columbia* river valley and either follow this gap through to *Portland* or reach *Seattle* by fairly accessible passes over the Cascades. In the south, two railways cross the Highlands—one via the *San José River* across the Colorado Plateau south of the *Grand Canyon* and then into the *San Joaquin* valley, and the other via *El Paso* and the *Gila* valley to *Los Angeles*. Apart from these main east to west lines there are some important north to south lines. One follows the chief fall-line towns along the coastal plains, linking up the busy north with its Florida pleasure resorts. Another links up *Denver* and *Cheyenne* and similar towns at the foot of the *Rockies*, while in the west another links up the valleys of California and Puget Sound.

Two other forms of transport are highly developed in the U.S.A. As the biggest centre of the petrol industries and the home of the mass production motor car it is natural that the country is one of motorists. This tendency is also partly due to the way in which the very size of the country has caused towns to be a long way apart, and individual towns to spread out over large areas, necessitating motor transport for nearly everybody.

In recent years there has been a tremendous development in aviation in the country. This is partly due to the big distances that

can be flown over land. These distances have stimulated the growth of mail and passenger air services to a very large extent.

EXERCISES ON CHAPTER XXV

1. Write an account of the petroleum industry of the United States.
(C.S.C.)
2. Describe the position of two centres of the iron and steel industry in the U.S.A. For each centre discuss the sources of raw materials, and how they reach the centre.
(C.S.C.)
3. Locate the chief manufacturing areas of the United States. How far do geographical conditions influence the locations of these areas?
(L.G.S.)
4. Describe a transcontinental railway route across the United States. Refer by the differences in types of landscapes and natural productions along the route.
(S.C. abridged.)
5. Locate the main textile manufacturing areas in the United States. State the geographical factors that have led to the development of each area.
6. Compare the Mississippi and the Great Lakes-St. Lawrence waterways.
(J.M.B.S.C.)
7. Discuss the parts played by the following factors in locating industries in the U.S.A : (a) power; (b) raw materials; (c) markets.

CHAPTER XXVI

UNITED STATES OF AMERICA—IV

Natural Regions

ALTHOUGH the country of the United States has been treated so far as a whole it is so large that it is difficult to grasp it entirely as one region, and as it is big enough to contain a large variety of natural regions these are summarised in order to make it easier to grasp the essential facts of its geography.

The North-East.—This is essentially the area of old settlement and of modern industry. It contains most of the original states and its place names show its relationship to Britain. North of the Hudson-Mohawk Gap lies the region known as *New England*, a region of glaciated soil and mixed farming which has been unable to compete with the farming of the interior. It now relies on truck farming and tourists in the country areas, but is chiefly noted as being a region of industry, this industry having sprung up in the first place owing to the large amount of water-power available. The chief town of this old area is Boston, for long the leading town of the new colonies. It was too shut off from the interior for it to compete in trade with towns further south, but it is important as the centre of a big industrial area and is still regarded as the home of American culture. The only other towns worth noting—other than manufacturing towns—are Portland, the chief town of Maine, and the famous University centres, Cambridge, near Boston where Harvard University is situated, and New Haven, the home of Yale University.

The middle Eastern area.—The *Hudson-Mohawk Gap* acts as a corridor through which traffic flows east and west, and has been responsible for the growth of New York, the largest city and commercial capital of the country, which lies at its seaward end, and which

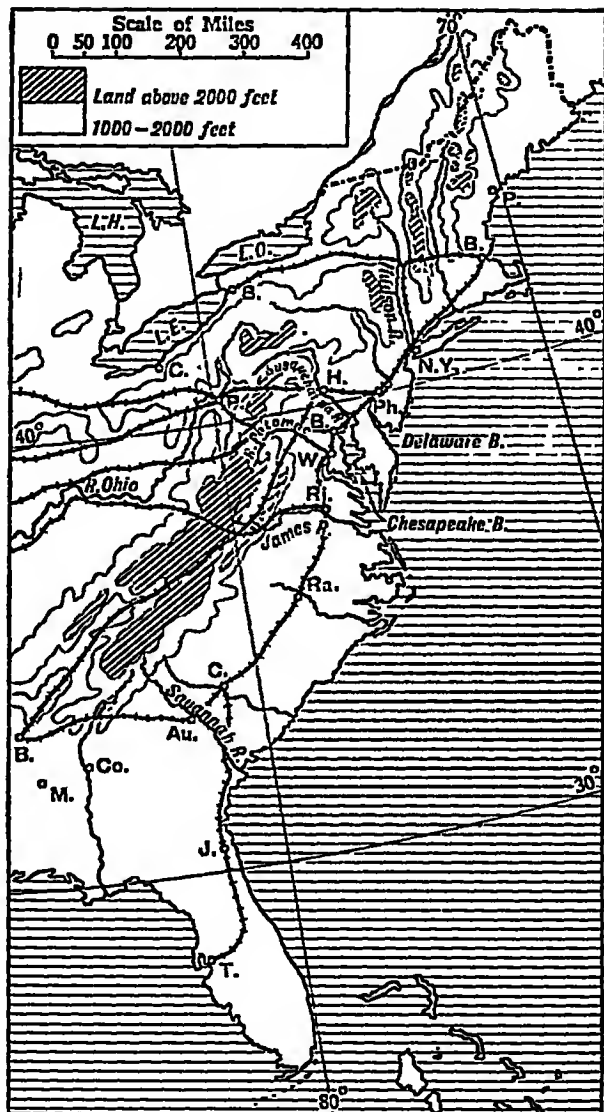


FIG. 83. EASTERN U.S.A.

Identify the towns marked.

- Note—(i) the way the coastal plain broadens to the south, with the drowned estuaries in the north ;
 (ii) the line of " Fall Line " towns from Baltimore (B.) to Columbus (Co.) ;
 (iii) the way the railways make use of river gaps in the highlands.

has grown steadily with the increase of the country's trade. At the lake end of the gap is *Buffalo*—a big trading and manufacturing centre, while in the gap itself are many busy industrial cities.

South of the gap lie the big estuaries of the Delaware and Chesapeake Bay. At the head of these estuaries settlements grew up at *Philadelphia* and *Baltimore* respectively, and, though now overshadowed by *New-York*, they are still important as manufacturing centres. The regions round are mainly devoted to mixed farming or trucking. The busy industrial area of the North Appalachian coalfield in Pennsylvania is part of this north-eastern area. Its main town is *Pittsburgh*, which has grown up at the important route point where the *Allegheny* and *Monongahela* Rivers combine to form the Ohio.

In the extreme south of this north-eastern region is *Washington*, the capital of the country, built on a magnificent site overlooking the Potomac River, and designed to avoid jealousy between Puritan north and Cavalier south.

The South-East, which includes Florida, is more tropical than the preceding area and is important as the home of the plantation developments which have played such a big part in America's story. The main occupations are concerned with tobacco, cotton, fruit and vegetables, but Florida is also one of the big winter holiday resorts for the northern industrial areas.

The towns in this area are smaller. They are chiefly situated along the Fall Line at the foot of the *Piedmont*, and are usually small manufacturing and market centres. The chief is *Richmond* in the tobacco area. *Birmingham* and *Atlanta* have grown important with the development of the Alabama coalfields. Along the coasts are the ports of *Norfolk*, a coal port, *Charleston*, and *Savannah*, which export cotton, and *Jacksonville*, *Miami*, and *Tampa* the chief towns of Florida.

The Central Plains can be regarded as one vast natural region. The distribution of occupations within this region has already been considered. The towns of the area are primarily market towns which have grown up at natural route points. In the wheat belt the chief towns are *Minneapolis* and *St. Paul*, twin cities at the *St. Anthony Falls* on the Mississippi, from which they derive power for their milling industries. *Duluth* and *Milwaukee* are lake ports in

this region. In the maize belt two towns stand out supreme. Chief of all the towns of the central area is *Chicago*. It is situated at the south of Lake Michigan, with an easy route to the navigation of the big river system by means of a canal to the Illinois River. Its position makes it the focus of many railways and it is a collecting and manufacturing centre for a vast area. Its industries are helped by cheap lake transport of raw materials and the nearness of the Illinois coalfield.

The other big town of the maize belt is *St. Louis*, which is an important bridge point near the confluence of the Mississippi and Missouri, and has easy routes east along the Ohio valley. *Kansas* and *Omaha* are important towns on the Missouri while *Louisville* and *Cincinnati* are manufacturing centres on the Ohio.

New Orleans, a port at the head of the Mississippi delta, is the main exporting centre for the cotton belt, though it is just south of the true cotton belt.

Other important centres in this region are *Austin*, *Fort Worth* and *Dallas* in Texas, while *Galveston*, *Houston* and *Mobile* have been mentioned as ports for cotton and oil.

The West really consists of a series of isolated regions corresponding to the physical regions noted in the chapter on the build of this area. The inter-montane plateaus are regions of scattered settlements based on irrigation, chief of which is *Salt Lake City*, or on mining as in the case of *Helena* and *Butte* in Montana.

Along the eastern foot of the Rockies are towns that are both mining and ranching centres, such as *Denver* and *Cheyenne*. In the more cultivated region of the Columbia valley the main centre is *Spokane*, situated on the chief routes into the region from the east.

In the temperate north-western area the main towns are ports. *Seattle* on Puget Sound, which serves Alaska and has the shortest sea route to Japan, is the chief of these. Also on Puget Sound is *Tacoma*, while on the Columbia is *Portland* which is a timber port.

The mediterranean climate area of California is the most thickly peopled part of the west. Its most famous town is *San Francisco*, with its harbour of the Golden Gate, which is the chief port of Western U.S.A. The building of bridges across the Golden Gate and to Oakland has improved its communication with its hinterland and



FIG. 84. THE WESTERN HIGHLANDS OF THE U.S.A. AND CANADA. Identify the towns marked. Note the routes of the chief railways. Compare this map with Fig. 75.

obviated a serious drawback. Across the bay is *Oakland*, another western port. All these western ports have benefited from the opening

of the Panama Canal. *Sacramento*, an inland town, is the original centre of the State and is still an important agricultural town. The largest town in the west is *Los Angeles*, which uses oil for manufactures and is probably best known by its suburb of Hollywood.

Alaska

In the north-west of the continent is the peninsula which the U.S.A. purchased from Russia. It is scarcely the waste area that it is so frequently supposed to be.

The region contains three distinct regions. In the north are the Brooks or Endicott Mountains, which border the Arctic Sea. In the centre is a region of plateaus drained by the Yukon River which flows westward and forms a big delta on the Bering Sea. Bordering the Pacific are ranges similar to those of British Columbia, with a fiord coast-line.

From the fiords of the coast-line come enormous quantities of *salmon* which form the main export of the country. It is possible to grow hardy cereals in the interior area, but there is very little farming. *Reindeer* have been introduced and have improved the lot of the natives.

The original magnet to settlement was gold, and there is still some *gold* mining in Alaska, and there are deposits of *copper* and *coal*. These minerals have led to the construction of railways, chief of which is the line from Seward, on the south coast, to Fairbanks on the Tanana, tributary of the Yukon.

The coast-line of Alaska borders the Canadian Yukon area, and from the Alaskan port of *Skagway* there is a railway across the *White Pass* to *White Horse* on the upper Yukon—whence there is a steamer or sledge communication via the river to the Canadian mining centre of *Dawson City*. *Juneau*, the administrative capital of the territory, is on the narrow strip of coast south of Skagway.

EXERCISES ON CHAPTER XXVI

1. What manufactures have been the most striking fact in the economic development of the New England States? Where are these manufactures situated, and what conditions have aided their development? (C.S.C.)

2. Briefly describe the route of a vessel on a journey from Vancouver to New Orleans, calling at San Francisco and Havana. What commodities would you expect to be taken on board at each of the ports named? State briefly the geographical reasons for your suggestions.

(L.G.S.)

3. Select three large ports on the west coast of North America, and describe and account for the trade that passes through each port.

(S.L.C.)

4. Comment on the following statistics and give reasons for the differences shown :

State.	Area in sq. miles.	Pop. in 1910.	Pop. in 1930.
California	- 155,652	2,377,549	5,677,251
Pennsylvania	44,832	7,665,111	9,631,350

(O.S.C.)

5. Discuss the situation and occupations of each of the following towns : Chicago, St. Louis, Denver, Philadelphia, Galveston.

CHAPTER XXVII

CANADA

Position and build.—Occupying the continent north of the Great Lakes and the 49° N. parallel is the self-governing British Dominion of Canada. Its position is such that much of its area lies in comparatively useless cold lands, so that its appearance on an atlas map, even one which does not exaggerate its area, gives a false impression of its potentialities.

Reference to the broad outlines of the build, in Chapter XIX, will indicate the essential features of the country's physical make-up. It is possible to distinguish four main areas.

Eastern areas.—In the east are the glaciated regions of old rocks which are a continuation of those of north-east U.S.A. Although a good deal of this area is made up of infertile rock, there are many patches of fertile lowlands, particularly the lowlands that stretch

along the St. Lawrence between Quebec and the Great Lakes. The coastal part of this area has sunk and has caused many inlets, chief of which is the *Bay of Fundy*, noted for its very high tides. The lowlands of the *Lake Peninsula* between Lakes Erie, Ontario and Huron, can be grouped with this region.

The Shield.—The second physical region is the Canadian or Laurentian Shield, with its old glaciated rocks, largely scraped bare of fertile soil save for one or two favoured places. It is a comparatively low region, sloping down to *Hudson Bay* in the north-east, with a steep rim along the coasts of Labrador and north of the St. Lawrence. It is dotted with innumerable small lakes drained by rivers flowing mostly to Hudson Bay, though in the south-east several rivers, particularly the *Ottawa* and the *Saguenay*, break through the rim of the plateau and drain to the St. Lawrence. It should be remembered that this region forms a practically uninhabited gap between eastern and western Canada. The Great Lakes are partly in Canada.

The prairies.—To the west of the Laurentian Shield and the Lakes lies the prairie region of Canada. A region of comparative lowlands, it is broad in the south and narrows to the Mackenzie valley in the north. It is not a continuously level area, but rises from the lowlands round *Lakes Winnipeg* and *Winnipegosis* and the *Red River*, lowlands formed by an old glacial lake, to the Rockies in two steps, so that the prairies can be regarded as divided into three regions or steps, the junction between each being a fairly well defined scarp. The first scarp is marked by the *Riding Mountains* and the second by the edge known as the *Grand Coteau de Missouri*. Both the higher western steps are cut up by deep river valleys and contain low hill ridges.

The Western Highlands of Canada are not so broad as those of the U.S.A. The eastern edge consists of the Rockies, here a compact range with several peaks over 10,000 feet. This mountain barrier is crossed by three important passes, the *Yellowhead*, *Kicking Horse* and *Crow's Nest* passes in that order from north to south. Immediately west of the Rockies lie the *Selkirk* and *Gold Ranges*, which run parallel to them, but are separated from them by a fairly well

marked valley containing the headwaters of the *Fraser*, *Columbia* and *Kootenay* rivers. From the Gold Range to the Coast Ranges, which are a northward continuation of the Cascade Mountains, the region is cut up by the above rivers and their tributaries into a series of isolated plateaus. The Canadian part of the Western Highlands has sunk so that the Coast Ranges of the U.S.A. are continued northwards by *Vancouver Island* and the *Queen Charlotte Islands*, the former being separated from the mainland by *Queen Charlotte Sound* and the *Strait of Georgia*. The coast of British Columbia is cut up by deep fiord inlets representing the drowned lower valleys of the rivers. The two main rivers draining into the Pacific are the *Fraser* and the *Skeena*, whose valleys have been of great value in providing railway routes across such difficult country.

Climate and vegetation.—Along the Arctic coastlands lies a region of barren Arctic waste, and to the south of this is a region with a cold interior type of climate (Nos. 11 and 12, Fig. 69). Thus much of the land has a poor climate which is unsuitable for good vegetation and unattractive to settlement. In the south are three areas of comparatively good climate. In the west lies an area of typical cool temperate western margin climate, with its moderate temperatures and regular rain (Nos. 4 and 7). Owing to the build many of the valleys are comparatively dry and those facing south are warm.

The Central Lowlands are of the interior type of climate (No. 8) with extremes of temperature and a summer maximum of rainfall. In the east is a region of cool temperate eastern margin climate (No. 9) having regular cyclonic rain, but with definitely cold winters owing to its relation to the land mass and to the influence of the cold Labrador current.

Canada contains some of the world's largest reserves of timber. The low temperatures make the rather light rainfall of the cold interior region sufficient for softwood conifers, and a vast coniferous forest stretches across the country from the St. Lawrence to the Pacific. To the north of this lie the tundra regions—known here as the *Barren Grounds*. The Eastern Highlands contained much forest which has been largely cut down, while the wetter Western Highlands

contain very rich supplies of timber, the trees being bigger and finer than those of the northern forests and containing species like the Douglas Firs. Between the Laurentian Shield and the Rockies and south of the northern forest belt is a region where the effective rainfall is insufficient for trees, and here are the vast treeless grasslands so well known as the Canadian Prairie.

Occupations and Productions

Farming.—The story of Canadian farming is very similar to that of the U.S.A. The original settlers in the eastern areas carried on farming as nearly as possible similar to that to which they had been

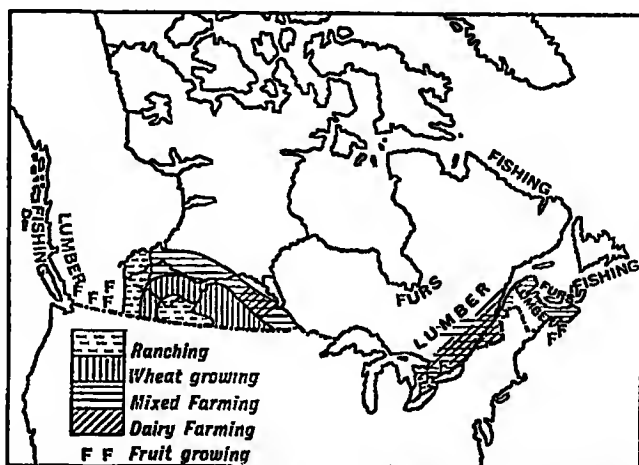


FIG. 85. OCCUPATIONS OF CANADA (EXCLUDING MINING).

Note—(i) the large area of land of little farming value ;
 (ii) the growth of mixed farming on the northern margin of the wheat-growing area.

accustomed in their home countries—France, England or Scotland as the case might be.

They were always handicapped by difficulties of climate and by the comparatively small amounts of level land. With the opening up of the prairies the eastern farmer turned to *dairy farming* as the main source of income. The dairy farmers of the St. Lawrence

lowlands and of the Lake Peninsula of Ontario now produce large quantities of *butter* and *cheese* which are exported to Europe. This big trade has been built up by co-operation among the farmers and has been helped by Government inspection and advice. Apart from the dairy farming the eastern areas are noted for other types of specialized farming. The sheltered *Annapolis* valley in Nova Scotia—near the Bay of Fundy—is famous for its *apples*. Along the shores of this bay in New Brunswick there are areas protected from the tides and known as the *diked lands* which yield big *hay* crops and so are important for dairy farming.

The Lake Peninsula of Ontario, owing to the tempering influence of the Great Lakes, is warm enough to produce *peaches*, *grapes* and similar fruits.

Prince Edward Island is the home of a new form of stock rearing, viz. *silver fox farming*, these animals being reared in captivity for the sake of their pelts.

With the building of railways across the continent the prairie lands became open to development. Their large areas of fertile glacial soil have become of great importance for the *wheat* crops that are large enough to make Canada one of the world's biggest granaries. The severe winters cause this region to grow spring-sown wheat, and in many districts this is still the only crop, and often the only product of the farm, so that a bad year may cause disaster to many farmers. As the more favoured lands along the south became occupied, cultivation had to spread northwards. This northward movement has been made possible by scientists who evolved types of wheat which would ripen more quickly and so were suitable for the shorter growing period of the more northerly regions. These northerly regions are rather uncertain for wheat-growing, so that the farmers have also developed *dairy farming* as an alternative, and recent tendencies have been for a general increase in *mixed farming* in these prairie regions.

The western edges of the prairie are too dry for wheat growing and they are mainly *cattle farming* centres but, in the valleys of the rivers that flow from the foothills of the Rockies, irrigation has been developed and *fruit farming* as well as wheat growing is carried on.

The mountainous area of Western Canada is naturally not well suited to agriculture, but in the warm and sheltered valleys of the Okanagan and the Kootenay, which open southwards, are rich *apple* orchards, the first named area being famous for its "Jonathan" apples.

Forest industries.—The large forest areas of Canada are among the big timber reserves of the world. Much of the area covered by forest is inaccessible, but the more accessible areas provide large quantities of timber and wood pulp.

The chief areas of timber stretch from the north shores of the St. Lawrence to the Rockies, but only the more accessible regions are cut. The lumbermen work in winter when the sap has sunk into the roots, the logs being piled near a frozen stream. The thaw enables these logs to be floated down stream in the summer and they are then sawn or pulped at mills near the transport facilities. The water power of the region is a great asset to this side of the lumber industry. Canada supplies wood pulp to the U.S.A. and Great Britain. The Government owns the forest land and maintains a very efficient watch against forest fires and ensures future supplies by afforestation schemes. The chief timber woods come from the western mountains.

These forest lands were once very important for their association with the fur trading of the Hudson Bay Company, which did so much to open up Canada. They still are the homes of trappers, both of European and Indian descent, but since the development of breeding fur-bearing animals in captivity this picturesque trade has diminished in importance.

Fishing.—There are two areas of fishing in Canada. Off the mouth of the St. Lawrence lie the Grand Banks of Newfoundland—one of the most famous fishing grounds in the world, and the cod fishing of this area is to a certain extent carried on by fishermen from the coasts of Nova Scotia.

In the west the rivers that flow down from the Cordilleras to the sea are the breeding grounds of countless shoals of salmon, the fish coming in to the rivers to spawn during the summer months. These ascending shoals are caught in vast numbers and are tinned and exported to all parts of the world. There are many canneries

along the coast, the chief centres being at *New Westminster* on the Fraser river and *Prince Rupert* on the Skeena river.

Mining.—Canada is one of the leading mineral producers of the world, for minerals are found in the rocks of both the Eastern Highlands and the Western Cordilleras. The area richest in minerals is the Laurentian Shield, but a good deal of this mineral wealth is as yet undeveloped owing to the inaccessibility of the region.

Coal is found in two main regions. In the east the principal mines are in Cape Breton Island, particularly near *Sydney*, and round *Pictou* (N.S.).

In the west the principal field stretches from the Kootenay valley into Alberta, the mining centres being at *Crow's Nest*, *Lethbridge*, and *Edmonton*. There is also coal near *Prince Rupert* and round *Nanaimo* on Vancouver Island, as well as in other scattered regions. There are large reserves of coal in these western regions, though much of it is of rather poor quality. In this region, too, along the foothills of the Rockies, *petroleum* and *natural gas* are found. There is some *iron* in Cape Breton Island round *Sydney*, but the iron used in Canada comes mainly from Newfoundland or the U.S.A.

Gold is mined in the Laurentian area of Ontario at *Porcupine* and the *Kirkland Lake district*, in British Columbia in the region of *Nelson* and *Trail* in the Kootenay valley, and in the *Yukon* valley in the north.

British Columbia produces supplies of *lead*, *zinc* and *copper* from the Kootenay district, while round *Sudbury* in Ontario is a region producing the world's main supply of *nickel*, as well as *copper*.

In Quebec, along the south shores of the St. Lawrence and more especially at *Asbestos*—between Quebec and the U.S.A. border—are large supplies of asbestos.

· Natural Regions

Build, climate and natural development point to three distinct regions in Canada—the older eastern area lying along the St. Lawrence river, the central lowland regions, and the mountains of the west.

Eastern Canada was the area of original settlement by French and British colonists. It contains the old rocks of the Laurentian area and the old Eastern Highlands, both considerably glaciated, while its areas of fertile lowland are comparatively small. Its farming is of the mixed variety, concentrating particularly on dairying and fruit production and the like, and it has considerable

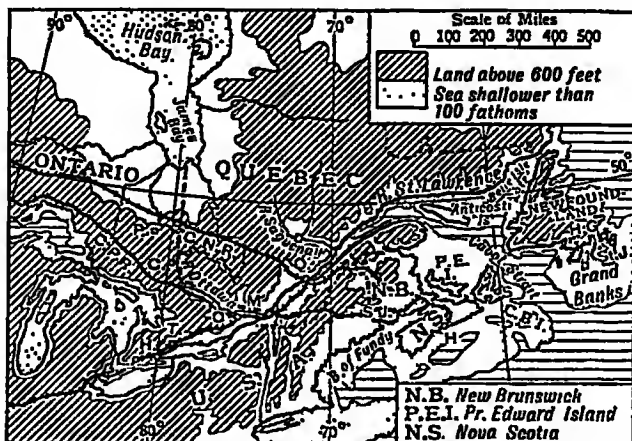


FIG. 86. EASTERN CANADA AND NEWFOUNDLAND.
Identify the towns. Note the direct C.P.R. route across
Maine (U.S.A.).

mineral and forest wealth. It contains the provinces of *Nova Scotia*, *New Brunswick*, *Prince Edward Island*, *Quebec* and *Ontario*. The first four are commonly known as the "maritime provinces" while the two latter extend into the cold northern lands. The towns are situated on the coast or in the centres of specialized mining or production regions.

Quebec—the old French capital—grew up at an easily defended spot at the old head of navigation of the St. Lawrence. With the improving of the river navigation, trade now mainly concentrates on *Montreal*, the head of navigation formed by the Lachine rapids, from which it now derives power. It has a magnificent island site, and apart from the St. Lawrence route way, has routes westward via the Ottawa river and southward to New York via the *Richelieu*

river and *Lake Champlain*. The navigation of the St. Lawrence is stopped in winter owing to ice, and at this period the Canadian port is *Halifax*, an ice free harbour in Nova Scotia, or *St. John* (N.B.) on the sheltered Bay of Fundy. *Sydney* (N.S.) is an important coal and iron centre.

Ottawa, chosen as Dominion capital owing to its intermediate position between French and English Canada, is at the head of navigation of the Ottawa rivers, the *Chaudière falls* also providing it with water power for lumbering industries.

Toronto is the chief town of Ontario, and is situated at a central route position on the fertile Lake Peninsula. It easily obtains raw materials from the adjacent areas of the U.S.A., and, with power from Niagara also available, it has become a busy manufacturing centre. *London* and *Hamilton* are also manufacturing towns in this region.

The Central Provinces.—Between the true eastern area and

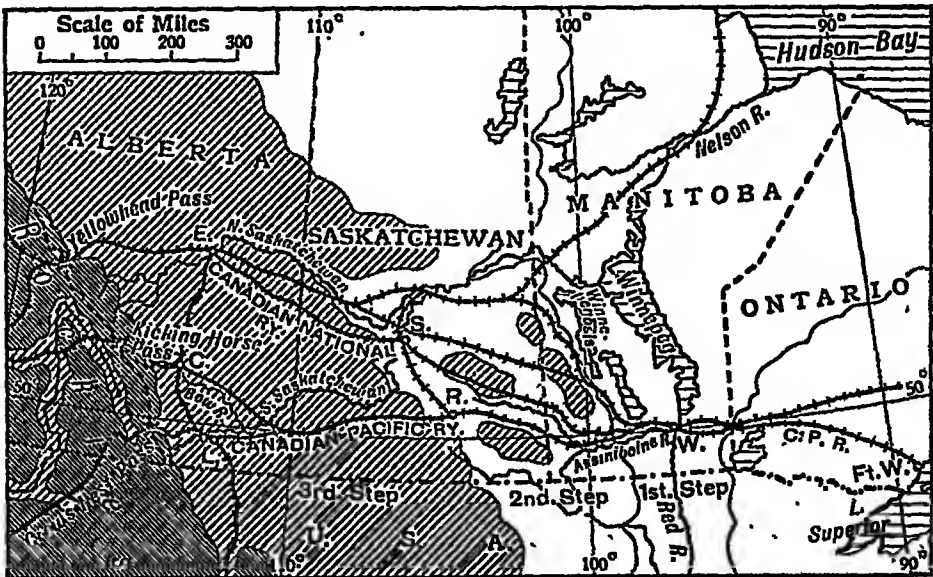


FIG. 87. THE PRAIRIE PROVINCES.

- Note—(i) east-west direction of the railways ;
 (ii) the "Prairie steps" ;
 (iii) the nodality of Winnipeg ;
 (iv) the railway to Hudson Bay—only in use for about six weeks.

the central province lies a stretch of comparatively unpopulated Laurentian area stretching along the north shores of the lakes. In the central provinces themselves—*Manitoba*, *Saskatchewan* and *Alberta*—lie the vast Canadian wheatlands and the western ranchlands. The three prairie steps and the farming conditions of this area have already been described. The towns are chiefly market towns that have grown up at favourable points along the trans-continental railway lines that have made the development of this area possible.

Chief of these market towns and commercial centre of the Canadian wheatlands is *Winnipeg*. This city has grown up from the old Hudson Bay Co.'s fur trading centre of Fort Garry, built at the confluence of the *Assiniboine* and *Red* Rivers, the latter giving a route south into U.S.A. At Winnipeg all east-west rail routes are forced to converge, as they have to come north of the Great Lakes and then keep south of Lake Winnipeg. This has led Winnipeg to become typical of what is known as a *nodal* route centre. Its position in connection with the wheat trade makes it a big elevator centre and a manufacturer of agricultural implements.

The principal towns in Saskatchewan, which is now the chief wheat producing state, are *Regina*, *Moosejaw* and *Saskatoon*.

In Alberta the main towns, *Calgary*, *Edmonton* and *Lethbridge*, are at the foot of the Rockies. Calgary is famous as the centre of the Alberta oilfields. Edmonton and Lethbridge are mining and ranching centres.

Western Canada is a land of mountains, valleys and fiords. The southern valleys have become important as fruit growing areas, the mountains provide supplies of minerals and timber, and the fiords have led to the rich fishing industry. Apart from mining centres the towns are coastal. Chief of these is *Vancouver*—built on *Burrard Inlet* to the north of the Fraser delta. It is the terminus of the C.P.R. and has important ocean routes across the Pacific to Asia and Australia. Further north is *Prince Rupert* on the Skeena estuary and terminus of the Canadian Northern.

Victoria, the State capital, is situated at the south of Vancouver Island, commanding Juan de Fuca Strait to the south of that island.

Apart from these regions there is the vast area of Northern Canada which is to all intents uninhabited save for wandering Eskimo and Indian tribes, fur traders, the miners of the Yukon area and the

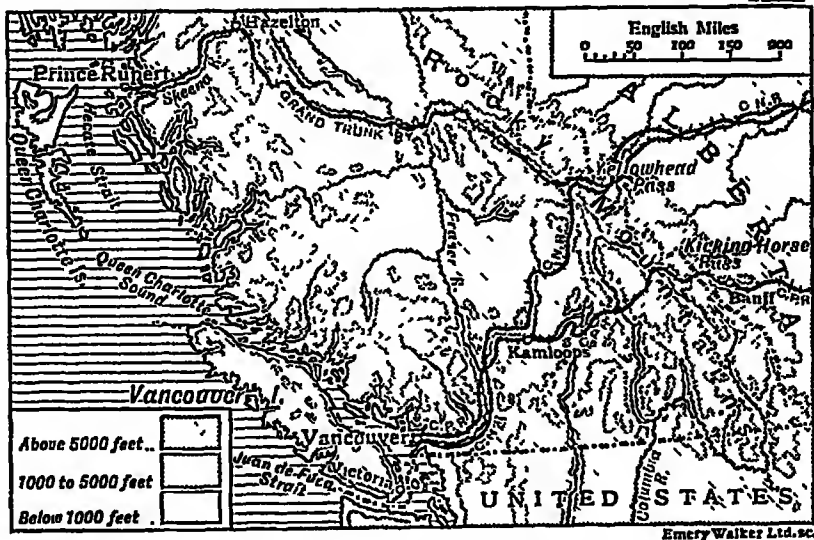


FIG. 88. BRITISH COLUMBIA.

Note—(i) the indented coastline ;
(ii) the routes followed by the railways.

famous North-West Mounted Police who administer the region. It should be noted, however, that there is some spread of farming northwards in the region of the Mackenzie valley.

Newfoundland

Lying across the mouth of the St. Lawrence is the island of Newfoundland—England's oldest colony. It is a continuation of the Eastern Highland regions and though the land is nowhere very high, the greatest heights being found in the south-west, much of the island consists of a low plateau. The coastlines are rugged and indented. Off the coast the continental shelf is broad and forms the famous Newfoundland Banks.

The climate is not attractive. The winters are cold and the summers never very warm, but the chief drawback is the dampness.

There is considerable rainfall from the frequent cyclonic disturbances, and fogs and mists are very frequent as the island is at the point where air from over the warm Gulf Stream meets cold air from over the Labrador current.

Productions.—Poor soil and climatic conditions prevent much agriculture. A certain amount of *dairy farming* can be carried on as it is possible to grow *oats*, *hay* and *root* crop. The main development is in connection with the *fishing* industry. The local fishermen are joined every summer by others from Europe and U.S.A. and large quantities of *cod* are caught on the *Grand Banks*. There is an export of dried cod to the "Latin" countries, and cod liver oil is an important article of commerce. The summer fishing grounds extend along the coast of Labrador—which is included politically in Newfoundland.

Much of the island is forested and the timber is used for the manufacture of *wood pulp* and *paper*—an industry assisted by the availability of hydro-electric power. There are considerable *iron ore* deposits, the main mining centre being at *Bell Island* and *Conception Bay*.

The population is just over a quarter of a million, and the only town of any size is *St. John's*, which is the centre of the fishing industry.

EXERCISES ON CHAPTER XXVII

1. Write a short account of the economic geography of the prairie provinces of Canada. (S.L.C.)
2. Describe the relief, climate and resources of Newfoundland. (C.S.C.)
3. Write a description of the prairie provinces of Canada under the headings: (a) surface features; (b) climatic features; (c) occupations; (d) distribution of population. (C.S.C.)
4. Write an account of the railways and waterways of Canada so as to emphasise their importance to the country. (C.S.C.)
5. Account for the routes of the principal transcontinental railways in Canada and indicate the principal towns through which they pass. (O. and C.S.C.)
6. Write a descriptive account of the occupations of the people in the forests of Eastern Canada and show in what ways they differ from those of the forests of British Guiana. (C.S.C.)

7. The following figures give the mean temperatures for January and July, and the annual rainfall at three stations in Canada in approximately the same latitude. How do you account for the very different climate of those three places?

	Jan.	July	Rainfall
Vancouver - -	35° F.	63° F.	72 in.
Winnipeg - -	-3° F.	66° F.	20 in.
Anticosti (Quebec)	13° F.	57° F.	30 in.

(S.L.C.)

8. Name two important exports produced in British Columbia and account for their importance. (C.S.C.)

9. Compare (a) the climate, (b) the occupations of the inhabitants of Alberta with those of Newfoundland, and account for the differences. (C.S.C.)

REVISION EXERCISES ON NORTH AMERICA

1. Name *two* of the principal occupations, in each of the regions named below, which are most clearly dependent upon local geographical conditions, and try to explain why these occupations have become important: New England, California, Alberta. (C.W.B.S.C.)

2. Draw a sketch map of the Basin of the Great Lakes and the St. Lawrence River to show the various routes by which goods may be shipped eastwards by water. (O.S.C.)

3. Describe the geographical factors which led to the importance of *four* of the following industries: (a) film making in California; (b) paper pulp manufacture in Eastern Canada; (c) fruit growing in British Columbia; (d) meat canning in Chicago; (e) steel manufacture in Pittsburgh. (O.S.C.)

4. Show how physical and climatic features are related to the scenery and occupations in either Manitoba or the Middle West of the U.S.A. (C.S.C.)

5. For each of the following occupations (a) ranching, (b) lumbering, (c) fruit growing, describe one area where the occupation is characteristic, and show how it is affected by geographical conditions. (C.S.C.)

6. Describe and account for the chief occupation of the inhabitants of two of the following areas: the Californian Valley, Jamaica, British Columbia, Manitoba, the New England States. (O.S.C.)

CHAPTER XXVIII

THE OLD WORLD

STRETCHING half-way round the world in the Northern Hemisphere lies the large land-mass that is known to geographers as *Eurasia*. This composite name is a convenient means of conveying the relationship that exists between the geography of Europe and Asia. It is possible to glimpse it as a whole as a background for a more detailed study, but it presents far too many complexities for a simple treatment.

Its enormous size can be understood by noting its geographical limits. Ireland (10° W.) to Kamchatka (170° W.) gives it a longitudinal dimension of half the world's circumference, while from Sumba (10° S.) to Spitsbergen (80° N.) gives it a much greater latitudinal dimension than that possessed by any other continental land-mass. Its main axes are approximately 45° N. and 75° E.

Build.—The outstanding fact in the build of this land-mass is the mainly east to west direction of its structure lines—in which it is in direct contrast to the north to south lines of the American land-masses.

All the physical features of the two continents are dwarfed by the tremendous system of fold mountains that stretches from Spain in the west to the Indo-Malayan area in the east (see Fig. 4). This system is generally known as the *Alpine system* (some reference has already been made to it in connection with Northern Africa). Comparatively recent in origin, these folds are consequently still very high compared with older systems that lie to the north and south. In Europe lie the high peaks of the Alps, with *Mt. Blanc* the highest, while in Asia the ranges culminate in *Mt. Everest*, which is really one of a group of giant peaks. The real core of the Asiatic part of the system is, however, the Pamir "knot", from which the ranges seem to

radiate, enclosing enormous plateaus and high valleys. The main details of this system are shown on Fig. 89.

In Asia an interesting feature of the Alpine system is the way in which it forms a series of bulges, the ranges opening out to include the table lands of *Anatolia*, *Iran* and *Tibet*.

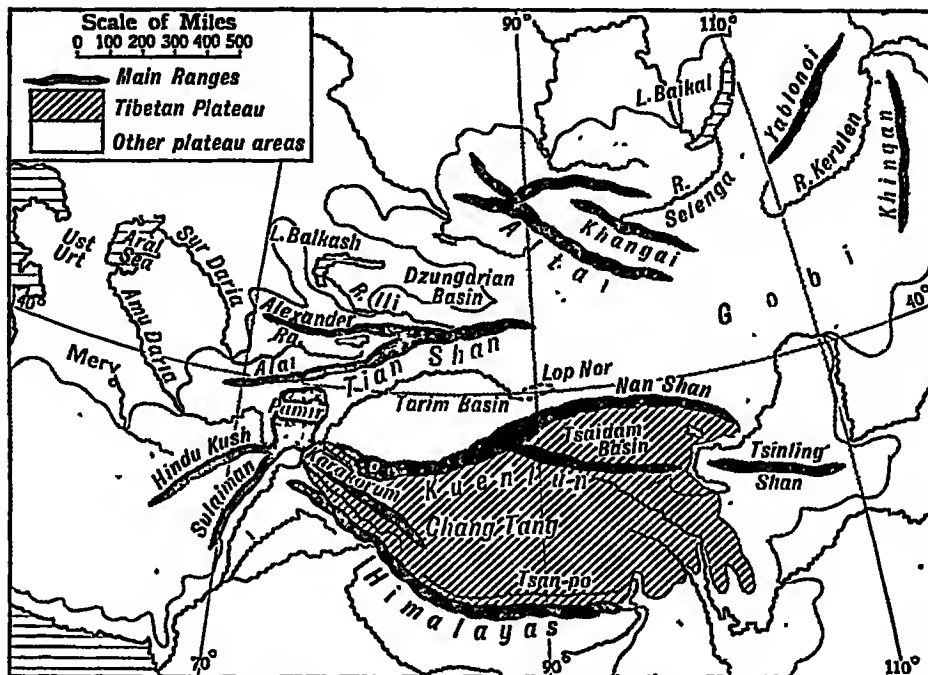


FIG. 89. THE "HEART OF ASIA".

This is merely a diagrammatic structural map, and there is no attempt to indicate the heights of the various regions.

A more detailed study of this vast mountain system will be necessary when each region is considered in its turn, but the continuity of the system should always be borne in mind.

This system was formed to the north of Gondwanaland, and two remnants of this old continent are found in Asia in the plateaus of *Arabia* and the *Deccan* of South India. Between the plateaus and the folds lie hollows, which have been largely filled in to form the *Mesopotamian* and *Indo-Gangetic plains*, while between Africa and the Alps lies the depression occupied by the Mediterranean Sea.

To the north of the folds are older remnants. In Europe are a series of old worn down plateaus, the remnants of an old system known as the *Hercynian system*. In the north-east and east of Asia are the worn down remains of a series of complicated mountain systems older than the Alpine group. There is still some uncertainty about the geological history of Asia, but it would seem fairly well established that, to the east of the Himalayas, the alpine folds sweep southwards to help form the fringing islands that lie off the south and east of the continent.

Stretching from the North Sea on the west to the centre of Siberia on the east is a vast lowland, broken only by the comparatively low *Urals*, which nowhere are really high enough to form a very marked climatic or human barrier. This plain consists of sedimentary rocks of varying ages. It is broadest to east and west of the *Urals*, and in this part the south forms a big depression only partially occupied by the *Caspian Sea*.

To the north-west of Europe lie the remnants of very old mountains forming the *Caledonian* systems of Scotland and Norway. To the east of these lies an area of very old hard rock, worn to a peneplain and covered with old sediments. This is the *Baltic Shield*, similar in many ways to the Laurentian Shield of North America. To the north of Lake Baikal in Siberia lies another area of similar type often known as *Angara land*.

Climate.—In considering the climate of Eurasia it is a very true generalization to say that the principal controlling factor is the size of the land-mass. The effects of a land-mass upon climate were discussed in Chapter IV. Eurasia is big enough to set up its own system of climatic controls and, in doing so, break down ordinary world climatic controls to a very large extent.

Pressure and winds.—The big east to west mountain system is exceedingly important in as much as it acts as a climatic divide between north and south. In Europe there is a marked difference between areas lying north and south of the Alps, and in Asia the contrasts between north and south are even more marked. The transition of climate takes place rather from west to east, for the influences of the west coast are able to penetrate a very long way inland.

A third point to bear in mind is that for climatic purposes the European area can hardly be said to extend as far east as the Urals. The heart of Russia—north of the Black Sea and east of a line approximately from the Gulf of Finland to the mouth of the Danube—is much more under the controls of the Asiatic land-mass. To the west of this line Europe is rather to be considered as a peninsula under westerly influences from the Atlantic Ocean.



FIG. 90. FACTORS INFLUENCING THE CLIMATE OF EURASIA IN JULY.

The essential factors in the climatic controls of the Eurasian area are shown in Figs. 90 and 91. In *July* the land-mass is so heated that there is an intense low pressure system over Asia, this being most marked over the Indus valley. This means that the normal high pressure area of the Horse Latitudes disappears, and with it the wind systems set up by it. Over Europe more or less normal conditions still obtain. The regions round the Mediterranean, lying between latitudes 30° and 40° , are practically without rain, but north of the mountain barrier the westerlies are able to penetrate far into the land, being attracted by the low pressures over Asia, so that all the northern area has rain in summer, though in the interior actual precipitation is due to convectional overturnings.

In Asia, winds are pulled in from the high pressure areas over the South Indian and Pacific Oceans. Those from the South Indian Ocean can be regarded as the South-East Trades till they reach the

equator, on crossing which they are deflected right and blow over India as the *south-west monsoons*. From the Pacific, *south-easterly* winds blow over China and Japan. Blowing from sea to land, these winds are naturally wet, the distribution of rainfall depending locally upon relief.

In *January* the interior of the land-mass is a region of intense cold, this being particularly so to the north of the mountain barrier, which

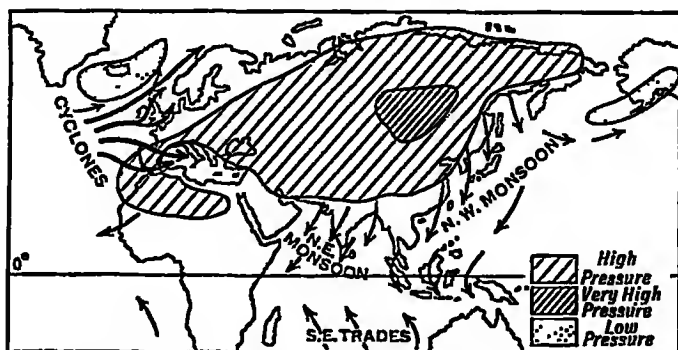


FIG. 91. FACTORS INFLUENCING THE CLIMATE OF EURASIA IN JANUARY.

effectually shuts off any warm influence from the south. The cold gives rise to a high pressure system which holds Asia in its grip for some months.

In Europe the influence of the cyclones of the Polar Front (see Chapter XX) are now of great importance. The low pressure area near *Iceland* is very marked and, as the map shows, air movements are mainly from the south-west and west. Cyclonic disturbances move chiefly along the north-western front of the high pressure, their influence being chiefly felt on the western seaboard, but sometimes extending far inland, while they also penetrate into the comparatively low pressure area of the Mediterranean and bring that region its chief rain.

From the high pressures over Asia, winds blow outwards. Over India these are *north-easterly*, and here may be regarded as the nor-

mal North-East Trades, though somewhat intensified. Over China and Japan the relative positions of the continental high pressure and the Pacific low pressure cause the winds to be mainly *north-west*.

Over South and East Asia the winds are thus reversed in direction in winter as compared with summer. These reversed winds are the *monsoons*. The areas experiencing these monsoon winds are alike in having their rain almost entirely in the summer months, as the winter winds are off shore and mainly dry. Within the monsoon belt there are considerable variations dependent upon temperature and local factors which will have to be considered when areas are dealt with in detail.

Temperature.—From this general account of climatic controls it has been possible to infer a good deal about temperature. The extremes of temperature brought about by the size of the land-mass are easily understandable. The greatest extremes are reached in the north-east of Asia, where *Verkhoyansk* has a mean January temperature of -58.9° F. and a mean July temperature of 59.7° —a mean annual range of 118.6° F.!

The western seaboard, within the constant influence of the mild air from off the Atlantic, are always moderate and have a very small range. The moderating influences of the Atlantic are particularly marked, as a region of warm surface water is drifted along the coasts into the Arctic circle and makes the temperatures of that coast much higher than would be expected for such latitudes. This region of warmth is known as the *Winter Gulf of Warmth*.

The east coast, on the other hand, is under continental influences in winter, so that its temperatures are extreme, and *Vladivostok* is frozen for some four months in the winter although it is a good deal further south than London.

In the south-west, Asia is practically continuous with Northern Africa, so that it is one land-mass. The Sahara of Africa continues across Arabia and dry conditions extend into the heart of the continent, which is shut off from the sea by the mountain systems. This interior desert region is subject to considerable extremes of temperature and so is classed among the cold deserts.

Climatic regions.—From the above description of the main controlling factors and from the general classification of world climatic

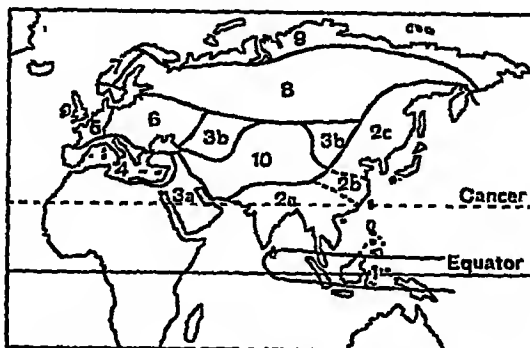


FIG. 92. CLIMATIC REGIONS OF EURASIA.

types it is possible to divide Eurasia into the following climatic regions. Reference numbers are to world climatic conditions.

1. Equatorial area—in the islands lying to the south-east (A 1).
2. Monsoon lands—which must be subdivided into
 - (a) Tropical Monsoon Area (A 4),
 - (b) Warm Temperate Monsoon Area (B 2b),
 - (c) Cool Temperate Monsoon Area (C 3b).
3. Desert areas—again subdivided into
 - (a) Hot Deserts of Arabia (A 5),
 - (b) Cold Deserts of Interior (A 5c).
4. Mediterranean Areas (B 1).
5. Cool Temperate Western Margin (C 1).
6. Cool Temperate Interior (C 2). The boundary between these two is not clearly marked for this is a gradual transition between Western and Eastern Europe.
7. Cold Western Margin (D 1).
8. Cold Interior (D 2)—occupying the greater part of the north of the Asiatic area.
9. The Arctic Coastlands (E).
10. The Mountain Regions—mainly in Central Asia.

Vegetation

The central deserts.—The vegetation map of Eurasia has one particularly striking feature—the “dead heart” of the continent lying almost entirely in Asia, in which the vegetation is exceedingly poor, consisting very largely of desert and semi-desert. This region lies too far to the south and east to receive rainfall from the cyclonic disturbances of the west, and is shut off from the monsoonal influences by the enormous mountain barriers. Much of this interior area is high so that the deserts are mountain deserts, with big temperature ranges from day to night, and vegetation is thus further hindered. Here and there in this region, particularly along the western edge of the *Pamir* and *Altai* ranges, the mountains give some slight relief rain and water from melting snows.

In Eurasia, as in all other continents, vegetation very much reflects climatic controls. In the more temperate areas to the north of the deserts are four main vegetation regions.

The tundra lies along the northern edge of the land-mass, on the margins of the Arctic Ocean. It is a region of very short growing period and so only mosses and lichens are able to grow. The ground is only thawed for a foot or so below the surface, so that there is a considerable amount of swamp. Southward this region gives way to the coniferous forest belt.

The northern forests are of two main types. By far the larger is the *Coniferous forest* belt which stretches from Scandinavia to the Pacific shores of Siberia.

This is a region of quite low rainfall, but as temperatures are low there is little loss of moisture by evaporation and so trees are able to grow. Much of this forest area is absolutely untouched and it is a very important source of actual and potential timber supply, though large regions of it, with their main natural outlets to the almost continually ice-bound Arctic coasts, are somewhat inaccessible.

Deciduous forest is found in the wetter and milder western regions. This occupies a rather wedge-shaped area stretching from the Atlantic, and narrowing as it goes eastwards to the Ural Mountains. Much of this region has been cleared of forest to allow of cultivation,

and only scattered areas of it are now to be found. Within it there are considerable areas of coniferous forest on the slopes of mountain ranges.

Round the Mediterranean the winter rainfall gives rise to its typical vegetation. *Evergreen trees* and shrubs are to be found, with a good deal of the coarse shrubland, known here as "maquis" scrub. Grass is of the coarse tough variety so that goats and sheep are reared rather than cattle. Here again much of the natural vegetation has been replaced by cultivation, which in many parts of the area is dependent upon irrigation.

Grasslands.—Between the forest lands and the semi-deserts is a grassland area known generally as the *Steppes*. This lies to the north of the Black Sea and stretches eastwards between the coniferous forest belt and the deserts. It is practically a continuous belt to the Pacific, save in Central Siberia, where the coniferous belt stretches southward and merges directly into the mountain desert of the interior. The western edges of this grassland area have been brought under cultivation, but eastwards it is the home of pastoralists at various stages of advancement.

Monsoon areas.—South of the central deserts lie the monsoon and equatorial areas. In these vegetation is almost directly controlled by rainfall, as the whole area enjoys a considerable period of warmth.

Equatorial forests are found in the islands of the East Indies and in the extreme south of the Malay Peninsula. They show all the usual features of this type and only in certain places have they been replaced by any ordered form of cultivation. The heavy rainfall of certain monsoon areas leads to jungle of equatorial type being found further north than the true equatorial forest limits. Such hot rain forests are found in Assam and Burma, in Western India and along the foot of the Himalayas.

Monsoon forests are found in the tropical parts of the monsoon belts where there is not sufficient rainfall for the thick jungle. They are important as having many hardwood trees, such as teak, which are of considerable commercial value. Temperate forests of both deciduous and coniferous types are found in Central and Northern

China and Japan, though here, as in Western Europe, a good deal of the region has been cleared for cultivation, particularly in the lowlands.

Tropical grasslands, rather of *savanna* type, are found inland in the southern monsoon areas. The comparative warmth of the dry season causing the grasses to be coarse in type. In North China natural grasslands are found which are really of the steppes type, for here the vegetation belts lying north and south of the deserts unite in the steppes of Manchuria and Mongolia.

It will be necessary to give more detailed consideration to the vegetation of certain of the regions in later chapters.

People.—At a very early stage in its history the region that now forms the desert heart of the land-mass enjoyed a much more congenial climate than it does at present. Somewhere within it the human race is generally supposed to have evolved, though the steps in that evolution are only slightly understood. From this central area waves of the human race spread outwards till they gradually reached to the uttermost edges of the earth. As its climate gradually worsened it ceased to be important as a centre of human settlement, but round it lie regions of dense population, and it acts as a divide between very distinctive racial types.

Within the confines of Asia are found races at all stages of development.

In Africa the most primitive peoples—the short *negritos*—were noticed as living in the unpleasant areas of the Congo forest and the Kalahari. In Asia other branches of this race are found scattered about in the south-eastern areas, among the forests of Malay and the East Indian islands where they form small groups of backward peoples, generally at a very low stage of development and practising very primitive forms of agriculture. These people seem to have moved in a south-easterly direction via India. In India are found other backward people referred to as the *pre-Dravidians*, for they gradually gave way to, and were replaced by, a more advanced racial group known as the *Dravidians*. This group is a branch of one of the really big racial groups of the world.

Throughout thousands of years there gradually spread outward

from south-western Asia the many branches of a race who now, between them, inhabit nearly all Europe and much of India and south-west Asia. This race is the *Caucasic* race. This includes all those peoples who are commonly described as Aryans, and other branches as well.

The main centre of the *Caucasic* race is now in Europe, where there are three main groups. To the north of the alpine folds are found the *Nordic* peoples, in Central Europe are found the *Alpine* peoples and south of there are the *Mediterranean* peoples. In the south-west of Asia are the *Semitic* group, while in Persia and Northern India are found a mixture of peoples, some similar to one of these groups and some to another. In Europe there has been a good deal of intermingling of these groups.

This big racial group, it will thus be seen, lies mainly south and west of the Asiatic mountain folds and desert region. The importance of the fertile plain of Mesopotamia as a bridge between the two main centres of the group should be noticed.

To the east of the desert area are found the branches of another great racial group, the *Mongols*. Without going into details it should be mentioned that there are certain definite distinguishing features between these groups. The *Caucasic* people are of many colours from white to brown: the *Mongols* are mainly yellowish. The *Caucasic* people have wavy hair, very rarely perfectly straight and of varying shades: the *Mongols* have straight black hair. There are many other details which are chiefly of anthropological interest, but most people have heard of the distinctive almond-shaped eye of the *Mongolic* people. The *Mongols* stretch from the south-east of Asia, where the main branch is the softer featured *Oceanic Mongols*, through China and Japan, where is the main group known as the *Southern Mongols*, to the north where are the *Northern Mongols*. To the north of the desert is a bridge of easily traversable land in the Steppes, and along this the *Mongols* made contact with the *Caucasic* peoples of the west. At the beginning of the present era *Mongol* hordes, leaving the slowly impoverishing areas of Central Asia, swept in conquering waves into Europe. They left no permanent impression there but as the result of those

raids people of Mongolic origin are found among the Caucasian peoples. Chief of these are the *Fins* of the Baltic area and the *Magyars* of Hungary.

There has also been some slight mingling of types in south-east Asia, in the regions of Burma and Assam, but the mountain barrier here has been so effective that these two main race groups are still almost completely distinct.

EXERCISES ON CHAPTER XXVIII

1. "Asia is a continent of contrasts." Discuss this statement with reference to relief and rainfall. (C.S.C.)
2. What geographical factors have led to the region known as "the dead heart of Asia"?
3. Describe and explain the climatic differences between the Mediterranean coast of Asia and the coasts of corresponding latitude on the east coast.
4. Draw a section of Asia along longitude 80° E., and indicate on it the vegetation as well as relief.

CHAPTER XXIX

JAPAN

LYING off the coast of Asia, some 120 miles from Korea, the nearest point of the mainland, are the group of islands forming the centre of the Japanese empire.

For centuries the land of "Cipangu" was wrapped in mystery to the West, though communications between it and China—very often of a warlike nature—had always been common.

In 1854, however, Japan was led to open her doors to Western trade, and did so thoroughly. Realizing their backwardness as compared with Western nations the Japanese set themselves to copy Western methods, and since then they have risen rapidly in importance. Japan is now the dominating Asiatic power, and is of really serious importance in the economics and politics of world affairs.

Build.—Japan proper consists of four main islands lying between latitudes 30° and 46° N. These four islands are *Hokkaido* in the north, *Honshiu*, the mainland, in the centre, and *Shikoku* and *Kiushiu* to the south, and together they occupy a roughly crescent shape on the edge of the continental shelf.

The islands are essentially mountainous, for they form part of the young fold systems that are so important in the structure of Asia. This folding has been comparatively recent and as a result Japan is a marked area of volcanic activity, so that there are many active and extinct volcanoes and regions of volcanic rock.

More important is the tremendous amount of *earthquake*-activity to which the islands are subject. This activity is connected with two facts in the structure. The main earthquake areas of the world are associated with lines of weakness, which are to be found in regions of comparatively recent folding. Further, just beyond the edge of the

sequently the island itself, run roughly north-east to south-west, and eventually open out so that the eastern chain lies in Honshiu while the western runs through Shikoku and Kiushiu, the valley between them sinking to form the *Inland Sea*, famed for its beauty and the cradle of Japanese maritime enterprise. In the region where the direction changes are many volcanic peaks and here there is the mountainous central part of the island, which is often known as the *Japanese Alps*.

The lowland areas are limited, the coastal plain being generally narrow and crossed by rapid streams which are of little use for navigation.

There are three main lowland regions. The largest is that in the centre of the east coast round *Tokyo*, while smaller plains are situated round *Nagoya* and *Kyoto*.

The island of Hokkaido in the north is very mountainous as, in addition to the main chain running northwards, there is also a branch which extends westwards and continues as the *Kurile Islands*—which are of an exceedingly volcanic nature.

Climate.—Japan lies almost entirely in the cool temperate eastern margin monsoon region (No. 2c). Its island position introduces modifications, and, though for general purposes it can be classified as belonging to one area, its latitudinal stretch causes considerable variation as from north to south. Hokkaido

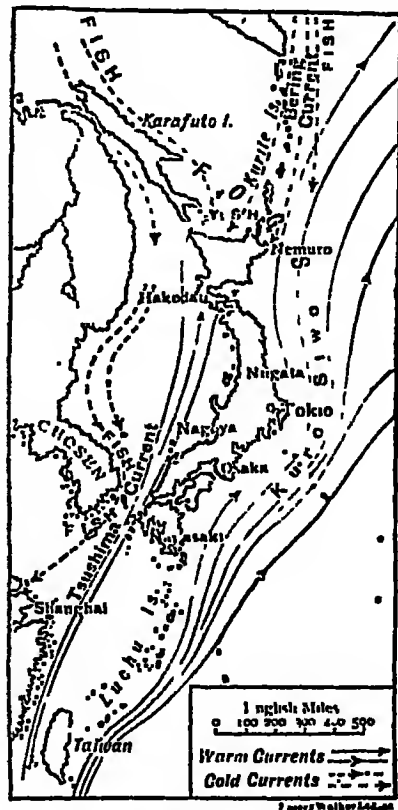


FIG. 94. THE CURRENTS INFLUENCING THE CLIMATE OF JAPAN.

is really so extreme as to come rather under the classification of cold rather than cool temperate, while the very south is warm temperate.

Winter conditions.—In the winter *north-west* winds from Central Asia blow strongly over Japan. They are not so cold as would be expected, for flowing along the west coast of Japan is a branch of the warm *Kuro Siwo current*. The most important effect of the north-west monsoon is to cause the west coast of Japan to have rain and snow in the winter, so that, although lying in a monsoon area, this coast has its maximum precipitation in winter. During winter the east coast, though sheltered, is somewhat cooled by a branch of the cold *Okhotsk current* along the coast.

Summer conditions.—In summer most of the land is hot. The *south-east monsoon* just influences the country, but for some reason, probably connected with local cyclonic influences, there is a maximum of rain in June, when the *plum rains* as they are called, give moisture at a most important period for harvest. *Typhoons* cause September to be a wet month as well. The heaviest rainfall occurs in the south.

Vegetation.—With such a variation in climate it is only natural that the vegetation should range from pine forests in the north to sub-tropical evergreens in the south.

Occupations and Productions

Farming.—Throughout its history agriculture has been the predominant occupation of the Japanese. Since only about a quarter of the surface is level enough to allow of cultivation it is essential that the utmost use should be made of what is available. Consequently the farming is "intensive" in type, the farms being small and cultivation being carried on largely by hand or by small primitive implements. In order to utilize as much land as possible hill-sides are terraced wherever possible, and fields in these regions are almost unbelievably small when judged by Western ideas.

Rice is the main crop and is grown in the irrigated *paddy fields* of terrace and plain wherever the climate permits. The "plum" rains are of great value in providing water just when the rice seedlings are transplanted to the main paddy fields.

Wheat and *rye* are grown in the north and in hill areas too cool for rice, while *barley* often forms a second crop after rice in the warmer south. *Beans* and other vegetables are also grown. Despite this heavy cropping of all available land Japan has to import food-

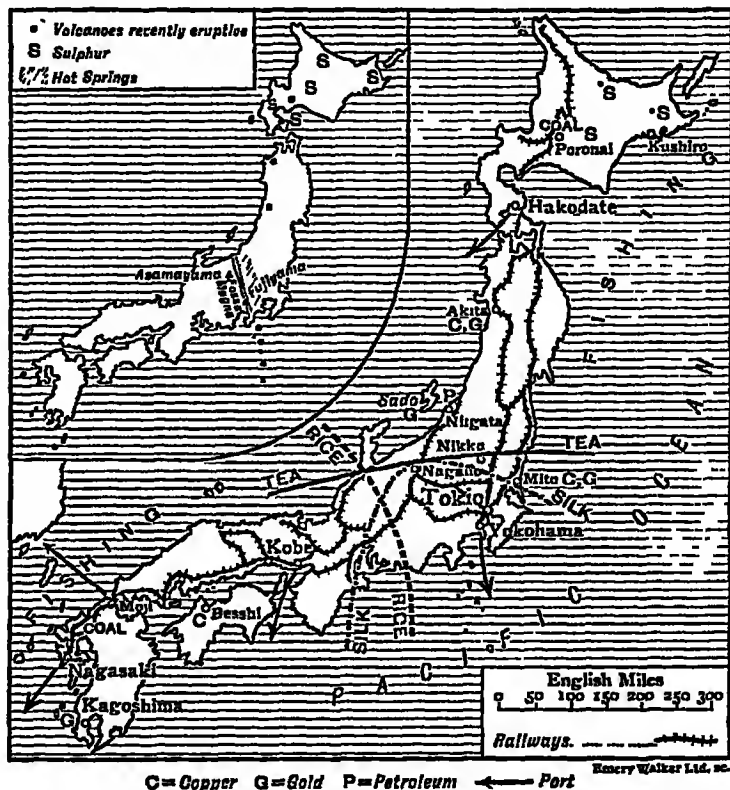


FIG. 95. JAPAN. MINERAL AREAS AND LIMITS OF MAIN VEGETABLE PRODUCTS.

stuffs, rice coming from Indo-China, wheat from Manchuria and America, and soya beans from Manchuria.

Mulberry trees are extensively cultivated as they provide food for silkworms. Silk is the main "cash" product of the Japanese peasant and Japan is the world's largest silk producer. A large quantity is exported, particularly to America.

In the south of Japan, *tea* is an important product, and there is some *cotton*-growing.

Pastoral occupations are unimportant, for as much land as possible has to be devoted to the growing of food.

Fishing is exceedingly important. The Inland sea and the shallow waters off the coast provide very important fishing grounds and Japanese fishermen have enabled Japan to become not only a naval power of world importance but also to develop a merchant navy, which meets the trade requirements of the country and acts as a carrier for other lands as well.

Mining and manufactures.—The country is not particularly rich in minerals. *Coal* is mined in north-west Kiushiu behind the port of *Nagasaki* and in the south of Hokkaido, but a certain amount has to be imported.

Iron is comparatively unimportant, the main Japanese supplies coming from Manchuria.

Copper is the main metal and comes from the central mountain area behind Tokio, and in the north of Honshiu.

Small quantities of *gold*, *silver* and *petroleum* are also obtained, and *sulphur* is found, as might be expected in a volcanic area. *Kaolin*, or china clay, which is formed from decomposed granitic material, is found in the *Nagoya* district and leads to a porcelain industry.

The recent rise of Japan to the position of one of the main industrial nations has been the most important feature of the post-War commercial world. The Japanese have always been skilful workers, and their *pottery* and *metalware* have been beautiful for centuries. This inherited skill, coupled with the need of exports with which to purchase food for her ever increasing population, has led to a highly skilled modern industrial system. The principal products are *textiles*, *small hardware goods* and *pottery*. Much of the work in textile mills is done by girls, who tend automatic looms which often include Japanese improvements upon the North of England originals. The main centres of the *cotton* industry are *Osaka*, *Kobe*, and *Kyoto*.

Silk and *artificial silk* are also made in these areas, and *Nagoya* is a *pottery* centre. *Tokio* and *Yokohama* have more *general industries*,

while *Nagasaki*, which has some local iron, is the chief *iron and steel* centre, and the main *shipbuilding* town.

These industries are considerably assisted by the large *hydro-electric* resources that build and climate make available, particularly in the southern regions.

Towns.—Most of the principal towns have been mentioned in

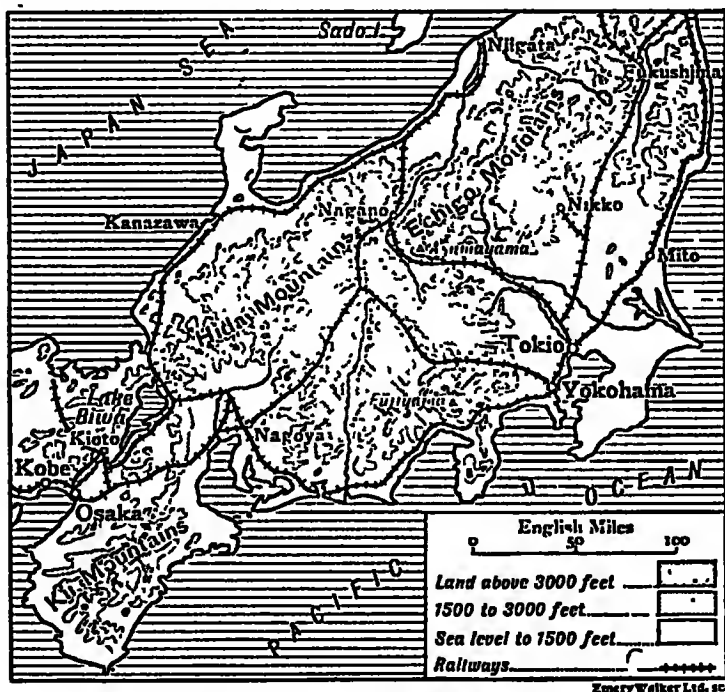


FIG. 96. TOWNS AND ROUTES OF CENTRAL HONSHU.

connection with the industries. These industries have developed at the old centres of population. The capital is *Tokio*, situated at the head of Tokyo Bay in the centre of the largest lowland. It has been a good route position (see Fig. 96), but the bay is too shallow for modern purposes and *Yokohama*, to the west of the bay and nearer the sea, is the chief port of modern Japan.

The old capital, *Kyoto*, grew up at a natural route position near Lake Biwa. At the eastern end of the Inland Sea, where the route from Tokio and Kyoto reaches the plains round that sea, stand the industrial centres of *Osaka* and *Kobe*. *Nagoya* is the chief town of a plain overlooking Owari Bay. To the extreme west of Honshiu is *Shimonoseki*, which controls the western entrance to the Inland Sea, and is the port for Fusan in Korea.

Niigata, on the west coast of Honshiu, has easy railway communication to the eastern plains, and is the port that serves the Siberian port of Vladivostok.

Nagasaki is the most important town in Kiushiu, and, in addition to its industries, is important as a naval base and as a port for China.

The chief port of Hokkaido is *Hakodate*, which has grown up at the point nearest to the mainland of Honshiu.

Formosa (Taiwan)

Situated roughly 100 miles off the coast of South-Eastern China and lying on the Tropic of Cancer is the island of Formosa which has been attached to the Japanese Empire since the Sino-Japanese war of 1895.

It is mountainous in the centre, with the chief lowlands on the west coast. The climate is largely tropical, the south having most of its rainfall in summer but the north receives rain from the winter monsoons.

The interior of the island is very little developed and is largely inhabited by savage tribes who oppose the advance of the agriculturists of the lowlands.

The island is of considerable value to Japan as it is able to produce sugar, which is not grown in the mainland, and a surplus of rice, both of these being exported to Japan. The forests of the interior produce camphor and bamboo.

The main towns are in the west and north. The capital, *Taiho-ku*, is a few miles inland in the north, and stands on the railway that runs from *Keelung* on the north coast, which is the chief commercial centre, to *Tainan* and *Takow* in the south-west.

Korea (Chosen)

The peninsula which stretches southwards from the mainland between latitudes 33° N. and 43° N., has been a portion of the Japanese

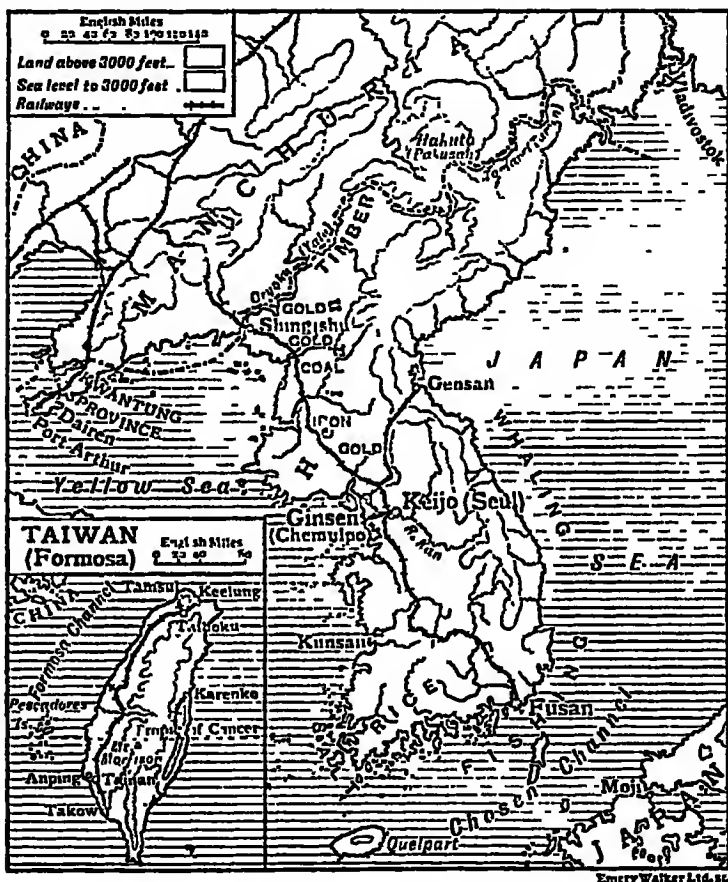


FIG. 97. CHosen AND TAIWAN

Empire since 1910, when it was annexed after a long history as a semi-independent kingdom, which for many years was known as the Hermit Kingdom because it would have no dealings with the outside world.

The outstanding physical feature is a mountain chain which is connected with the mountains of Eastern Manchuria. This runs to the east of the peninsula, so that the main rivers and lowlands are on the west.

The climate is of the extreme monsoon type, and is very similar to that of Manchuria and North China.

Rice is the principal food crop, with *barley* and *soya beans* next in importance. The Japanese have stimulated the production of *cotton* and *silk*, while a specialized product is *ginseng*—a medicinal root exported to China.

The mineral wealth of the country is now being developed. *Iron* and *gold* are both mined in the north-west, and *anthracite* is also mined near by.

The chief town is *Seoul* in the centre of the west coast, but the main port is *Fusan*, situated at the point of the peninsula nearest to Japan. In the extreme north-east the port of *Kionsong* has recently been connected with the Manchurian railway system and will serve Northern Manchuria.

EXERCISES ON CHAPTER XXIX

1. Give an account of the climate of Japan, showing how it is related to (a) latitude, (b) relief, (c) ocean currents. (C.S.C.)
2. Show how Japan is dependent upon other Asiatic countries for (a) raw materials, (b) food supplies, (c) markets. (C.S.C.)
3. Write a geographical account of the textile trade of Japan stating (a) the centres of manufacture, (b) the sources of raw material, and (c) the markets to which Japan sends her goods. (C.S.C.)
4. What reasons have led Japan to be described as "the Britain of the East"? Is the comparison justifiable?

CHAPTER XXX

CHINA

As one of the earliest centres of civilization, and as the present home of nearly a quarter of the human race, China should rank as one of the really important countries of the world. That it does not do so is partly a matter of history and social development which is largely beyond the scope of the present chapter. The first details brought to the West by Marco Polo in the thirteenth century told of a well-organized and prosperous community with a civilization equal to that of any other part of the world. Since then China has remained almost static while the West has progressed, and during the present century it has been undergoing a painful period of change which has riven the country from end to end, so that it has often seemed that it would fall to pieces, or be divided by stronger powers. But China still remains, and the peasant life goes on in much the same way that it has done for many centuries, so that, with all the attempts at westernization so far falling short of attainment, the family organization on which the country has developed would seem to have given a stable foundation, which has held firm despite the tottering Governments that have come and gone since the final break up of the Manchu dynastic rule in 1911-12.

Hitherto it has always been the custom to speak of China proper—meaning the main core of the country, and the Chinese empire—which included the outlying provinces of Tibet, Turkestan, Mongolia and Manchuria. These latter, however, have now ceased to be ruled from China and so can hardly be said to form part of the Chinese empire.

China itself lies east of the mountain heart of Asia, stretching from the north of the Indo-Chinese peninsula to the mountains

bordering the Gobi desert in the north. Thus it lies mainly between latitudes 20° N. and 40° N.

Build: North China.—In the north the ranges that stretch

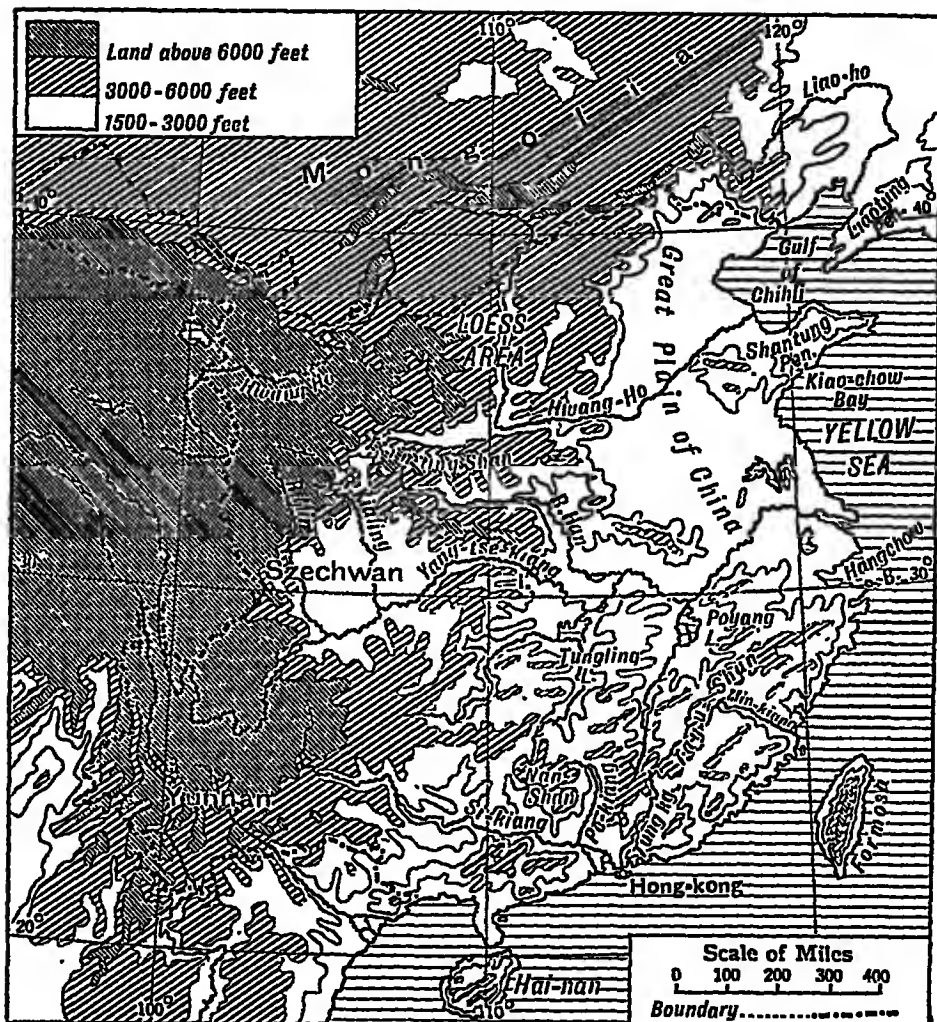


FIG. 98. CHINA—PHYSICAL FEATURES.

eastward from Central Asia form the west to east chains of the *Nan Shan* and *Tsinling* Mountains, between which lies a plateau area drained by the upper courses of the *Hwang-ho*. Much of the

surface of this plateau has been covered with thick deposits of wind-borne *loess* brought from the plains of Central Asia, though to a certain extent the distribution of the loess is due to subsequent deposition by river action. In this loess area the rivers have cut deep gorges and roads too are often deep in steep-sided canyons.

This easily eroded material has been carried eastward by the Hwang-ho and has built up a vast alluvial plain which extends southwards and joins the alluvial plains at the mouth of the Yang-tse-kiang.

In this plain deposition has led to the slow-flowing Hwang-ho building up its bed to such an extent that in many areas it is flowing well above the level of the surrounding plain. Consequently floods have been frequent and have led to great loss of life and material damage, while the river has often changed its course when the flood has subsided. In 1852 it changed its course to the extent of flowing into the *Gulf of the Chihli* to the north of *Shantung* instead of into the *Yellow Sea* to the south of the peninsula. The loess deposits are yellow in colour, and the river is yellowish looking—its name means Yellow river—and the dust from the loess area frequently fills the air of North China and forms a yellowish haze.

The *Peninsula of Shantung* lies to the east of the plain and is a mountainous region which is really a southward continuation of the mountains of Eastern Manchuria and the *Liaotung Peninsula*. The mountain system is broken through just behind *Kiao-chow Harbour*.

Central China consists of the valley of the *Yang-tse-kiang* which flows from the plateau of *Tibet*. The divide between the Hwang-ho valley and the Yang-tse valley is the *Tsinling-shan*, a range which runs eastward from the *Kwen lun*. Immediately to the south of this is the valley of the *Han* that joins the Yang-tse at *Hankow*. The Yang-tse itself, after leaving *Tibet*, flows southward through one of the deep-cut north to south valleys in the *Plateau of Szechwan*. Then it turns eastwards and then north-east and here, on its left bank, lies a region of red sandstone, drained by the *Min*, which is famed as the *Red Basin of Szechwan*, one of the most fertile areas of China. On its right bank is a plateau area and where the river breaks through this at *Ichang* are gorges and rapids that make navi-

gation difficult. In its lower course the Yang-tse forms a plain which joins the plain of the Hwang-ho.

The lakes *Tungting* and *Poyang*, to the south of the river, are important as they act to a certain extent as safety valves when the river rises with the melting of the snows in the western mountains in early summer.

The land to the south of the river is largely mountainous and consists of an old system of worn down folds in which the valleys are usually narrow and contain only comparatively small areas of level land. This region is drained by a series of right bank tributaries of the Yang-tse.

South China.—South of the Yang-tse area are three regions. Along the south-east coast is a mountain area shut off from the Yang-tse basin by the *Tayu Shan* and drained by a series of rivers of which the chief is the *Min-kiang*. The coast-line of this area is rugged and shows evidence of having sunk in recent times.

In the south, separated from the Yang-tse valley by the *Nan Shan*, is the valley of the *Si-kiang*, a region containing fertile lowlands of which the most important is the large area formed by the combined deltas of the *Si-kiang*, *Pe-kiang* and *Tung-kiang*. In the south-west lies the *Plateau of Yunnan*. This is a region of old rocks dissected by deep and narrow river valleys, most of which drain southwards to the rivers of Indo-China. The area is most difficult of access and its remoteness is shown by the presence here of groups of primitive people who are not really Chinese.

Climate

China is extensive enough to contain all three main varieties of the monsoon climate—tropical, warm temperate and cool temperate. The west to east direction of its main mountain systems plays a considerable part in the distribution of climatic types.

Winter conditions.—In winter the land is exposed to the cold *north-west winds* from Central Asia. The whole of North China is extremely cold, and cold spells bringing snow and frost are not unknown even as far south as Canton on the Tropic. The Yang-tse

basin has a fairly cold winter, but the Red Basin of Szechwan is protected by mountains and is mild.

These winds are dry but cause the dust storms and haze so common in North China. The areas south of the Tsinling-shan have a certain amount of winter rain caused by cyclonic activity, the cause of which is not very well understood.

Summer conditions.—In summer the land becomes a low pressure region and *south-east winds* are experienced, but, as in Japan, these are not so strong as those of winter. The whole of China has a hot summer, nearly all the lowlands having a July temperature well over 80° F., and in most areas this is made more unpleasant by a very high relative humidity.

Rainfall is heaviest in the south-east, especially in the Si-kiang valley and in the eastern slopes of the Tayu Shan. The maximum in the Yang-tse valley comes in early summer, and is comparable with the "plum rains" of Japan.

It is thus possible to divide the country into its three main regions : *Cold Temperate Monsoon* north of the Tsinling-shan, *Warm Temperate Monsoon* in the central area, and *Tropical* in the Si-kiang valley.

Productions and Occupations

Farming.—Throughout many centuries China has been a land of careful and intensive agriculture. Much of the country is of a mountainous character, with land too infertile or slopes too steep for farming. It is estimated that less than a quarter of the total surface can be devoted to crops. As a result, the ever-growing population has had to concentrate on the fertile areas of valley and lowland.

The lower slopes have been terraced to give as much room as possible. Unfortunately in some areas trees have been cut on slopes where agriculture could not succeed and soil has been washed away, often ruining hillside and valley.

Farms are small and much cultivation is done by hand, the main draught animal being the water buffalo. Wherever possible two crops are obtained from the same field, but the Chinese farmer is always struggling hard to grow enough food to feed himself and his

family and to produce a few surplus products that can be sold to provide his modest requirements.

Rice is the main food crop of all save the northern area, for as it wants a hot period of at least five months and a good supply of water in order that it may be grown in swamp conditions in its early stages, it is not found to any great extent to the north of the Tsinlingshan. In central areas one crop of rice is grown and is then followed

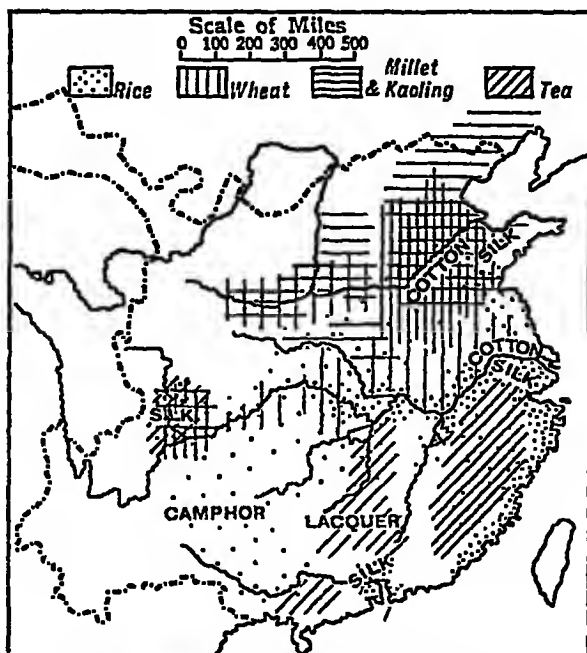


FIG. 99. VEGETABLE PRODUCTS OF CHINA.

by a crop requiring less heat and moisture. In the south two crops of rice can be obtained.

Wheat is the main food crop of the northern plains, and is found also in Central China. In the north it is a *spring crop*, as winters are very cold, but in more southern districts it is grown as a *winter crop*. *Millet*, a small grain, and *kaoling*, a tall grain rather like maize in appearance, are grown in drier districts.

In addition to these grain crops *leguminous plants* of many kinds are grown, usually forming the subsidiary crop to rice or wheat.

Chief of these is the *soya bean*. This is used locally and also furnishes an important export. There are many varieties, but all yield a paste and sauce which is used for human food. It gives oil used locally for cooking or commercially as an industrial oil, and yields an end-product which is of great value as a fertilizer and cattle food. This plant has risen to a position of great importance during the present century.

Apart from these food crops there are five important natural products; of these the best known is *tea*. China is the home of the tea plant, and for many years was the chief supplier to world markets. Since the development of tea growing in India and Ceylon its export has declined. The chief tea producing regions are in the south-east in the region round *Foo-chow*, in the southern portion of the Yang-tse basin and in the Red Basin of Szechwan. The trade is carried on through *Foo-chow*, *Shanghai* and *Hankow*, the last being a centre for overland export to Central Asia.

Silk is produced in large quantities and in addition to a big local use there is a considerable export. It is produced very widely but there are four main areas. In *Shantung* the silkworms are fed on oak leaves as the climate is too severe for mulberries. The other areas are round *Chengtzu* in Szechwan, in the Si-kiang valley round *Canton*, and, most important of all, in the plains near the Yang-tse, where *Hangchow*, *Huchow* and *Suchow* are all famous, and *Wusih*, near *Suchow*, produces the finest white silk in the world.

Cotton has been steadily growing in importance, for it provides a valuable cash crop. It is grown in the Yang-tse valley from *Wuhan* to the sea, the chief region being near the mouth below *Nanking*, where American types have been introduced. It is also grown in the lower valley of the Hwang-ho. In most places cotton is grown in conjunction with another crop, often winter wheat, when the cotton seed is planted between rows of wheat just before it is reaped.

Tobacco is grown in most districts and there is a considerable export as well as a large home consumption.

Poppies for opium are still grown though opium production is illegal. There has been a considerable decline in the industry and

this has stimulated the production of cotton and tobacco which now form the main cash crops.

Apart from these crops there are many others, while from the forests of the high areas of the south *camphor* and *lacquer* are obtained.

The large population, the comparatively small amount of fertile land, the highly localized form of Chinese development and lack of easy transport facilities, and the liability of the river basins to flood, combine to cause China to present the spectacle of a vast section of the human race living almost constantly on the border line of subsistence in a country which has some of the most fertile and productive lands of the world.

Minerals.—China has a considerable mineral wealth, much of it not appreciably developed, although native mining has been going on for many centuries.

Coal is the most important mineral, and the country has considerable reserves of it. The largest deposits are in the north in and near the loess region. The main mining centre is *Kaiping*, to the north of *Tientsin*, but mining is carried on in the eastern edge of the *Shansi Highlands* near the railway running south from *Peiping*. It is also found on the edge of the *Tsingling-shan* in the province of *Honan*.

These northern deposits contain both bituminous coal and considerable areas of anthracite. The seams are often thick and are practically undisturbed. In places they outcrop so that mining is easy, and in time this may become a very important mineral area.

Other mining areas are in *Shantung* along the western edge of the central mountains, in the Red Basin of *Szechwan*, at *Changsha* in *Hunan*, and in the *Si-kiang* valley just north of *Canton*.

Iron is also fairly widespread. The chief deposits are at *Ta-yeh*, which led to iron smelting at *Hanyang*, though this has stopped for the time being. There are scattered supplies in *Shansi*, and near the coalfields of *Shantung*.

Tin is mined chiefly in south *Yunnan*, near *Mengtsz*, whence there is a considerable export to Hong Kong. There are other scattered deposits in the south but these are of little importance.

Other metals obtained from the south are *copper*, mined chiefly in Yunnan, *antimony* and *tungsten* which are both found mainly in Hunan, *manganese* and *mercury*.

The development of this mineral wealth is hampered by the location of the chief mineral areas. They are nearly all at a con-

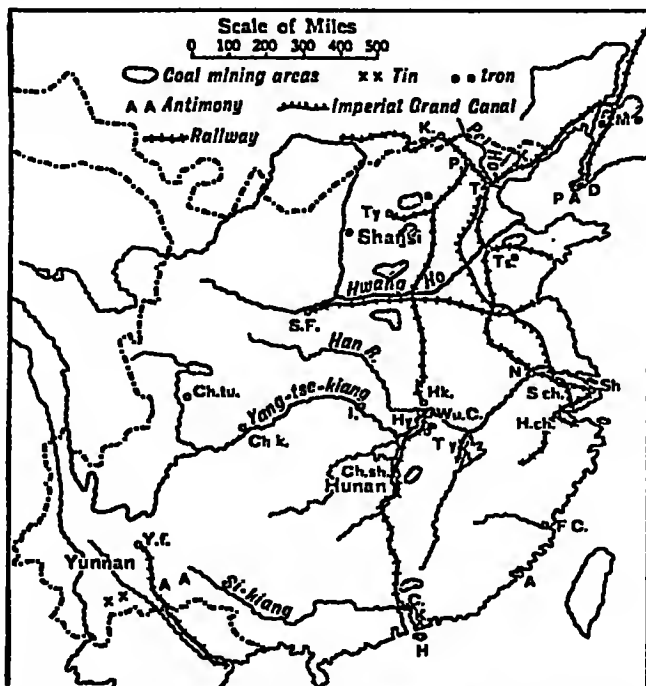


FIG. 100. RAILWAYS AND MINERALS OF CHINA AND SOUTH MANCHUKUO.

Identify the towns indicated.

siderable distance from the coast and transport facilities are exceedingly poor. The metals are further hampered by not having any very accessible coalfields in their proximity, so that they have not been developed sufficiently to meet more than immediate local needs, and consequently China as a whole is an importer of metal goods.

EXERCISES ON CHAPTER XXX

1. State where tea is grown in China and write a descriptive account of its productions under the headings (a) relief, (b) climate, (c) labour employed. (C.S.C.)
2. Describe the most important geographical features of the Hwang-ho basin, and show how they have affected the mode of life of the inhabitants. (O. and C.S.C.)
3. Give an account of the distribution of agriculture in the Yang-tse-kiang basin. State the main crops grown and the conditions under which each is produced most favourably. (C.S.C.)
4. Compare and contrast the climates and crops of the basins of the Hwang-ho and the Yang-tse-kiang.
5. Discuss the factors influencing the distribution of the main food crops of China.

CHAPTER XXXI

CHINA

Natural Regions and Towns

CHINA is easily divisible into three large areas by taking the three big river basins as units. There is considerable justification for this, but within each area a certain amount of sub-division is necessary. These three main areas are taken here, with the sub-divisions indicated.

Northern China consists of the valley of the Hwang-ho, and is the area lying north of the Tsinling-shan. There are two main regions within it.

The *loess* area occupies the middle portion of the valley. Its build has already been discussed. It is a region of extreme climate and comparatively low rainfall so that dry method farming is followed. Roads and rivers lie in deep-cut valleys and many of the people live in caves cut into the sides of such valleys. The region

will one day be of considerable importance owing to the vast wealth of coal and iron underlying the area.

The main towns are *Taiyuan* in the heart of the Shansi Highlands, to which a railway has been built from Peiping, and *Sian-fu*. There has always been an important route through the latter from the plains to the heart of Asia, and a railway is being built to connect it with the plains.

The North China plain is the enormous alluvial area built up of material brought down from the loess region by the Hwang-ho and the Pei-ho. It is a rich fertile region, with a rather extreme climate and an adequate summer rainfall, and it has a large population which, industrious as it is, has not overcome the flood danger that constantly threatens the area when summer rainfall and melting snows add to the volume of the rivers.

The large population consists chiefly of peasants and farmers, but there are some large and important towns. Chief of these is *Peiping* (or Peking), the old capital of the Manchu conquerors, which commands the gateway between the Highlands and the Gulf of Pe-chihli, and which also controls a route to Mongolia. It is connected by rail to Manchuria, to Kalgan in Mongolia, to Hankow and to Tsing-tao in Shantung. From it the *Grand Canal* goes to Hangchow, in the Yang-tse basin, but, though parts of this are still used, it is not now so important as when it carried produce from the Yang-tse to the Imperial capital by a route avoiding the storms of the Yellow Sea. Its port is *Tientsin*, a rather poor harbour on the Pei-ho River, through which a good deal of North China's commerce passes. Other towns are *Tsi-nan* and *Chengchow*, which are mainly of local importance.

Central China is unified by the Yang-tse-kiang, which forms the main line of communication through the area. It is, however, possible to distinguish several important sub-regions.

Szechwan, the vast province in the west, is mainly a region of hills and valleys, the latter being fertile and well cultivated. The richest area is the "red basin". Careful irrigation, the terracing of the slopes, and a climate enabling two or more crops a year to be grown make this one of the most productive and densely peopled

areas of the country, and it will become more important as minerals are developed. The main towns are *Chung-king*, the chief river port of the region, situated at the confluence of the Kia-ling with the main stream, and *Chengtu*, the centre of a rich region in the valley of the Min.

The central *Yang-tse basin* lies between the Tsinling-shan to the north and the Nan Shan to the south, and includes the valleys of several important streams. It is a comparatively mountainous region, particularly to the south of the river, so that population is concentrated in the river valleys and on the lower slopes of the hills, which can be terraced for rice cultivation. The northern area, drained by the Han-kiang, is less fertile than the southern area, which has an important cash crop in tea.

The region along the Yang-tse is low lying and is particularly liable to floods, several big floods having occurred in recent years.

The main population centre is the group of cities at the confluence of the Han and the Yang-tse, *Hankow*, *Hanyang* and *Wuchang*, known collectively as *Wuhan*. *Hankow* is the main commercial centre of Central China, being situated at the point where the main north to south route of the country crosses the main river route. The building of railways and the development of minerals and other resources are making Wuhan a city of vast commercial importance. *Ichang* is the head of easy navigation, for above it are the miles of rapids of the Ichang gorges.

The lower *Yang-tse basin* really includes all the low land below *Hankow*. In the east it forms a vast alluvial plain which to the north merges with the plain of the lower Hwang-ho. It is probably the most fertile area in China; it is certainly the most intensively developed, for its agricultural population is exceedingly large and industrious, although, owing to its great concentration and the liability to floods, it is not so rich as might be expected. There are many large towns in this region, towns with histories reaching back for centuries, for many of them were large and important in the days of Marco Polo.

By far the largest and most important, however, is the comparatively new city of *Shanghai*. This has grown up round the foreign

“concessions” that were granted for trading purposes on the banks of the Whangpo a few miles upstream from its entry into the Yang-tse. The position of this trading centre near the mouth of the great river has attracted all the trade of Central China, so that Shanghai

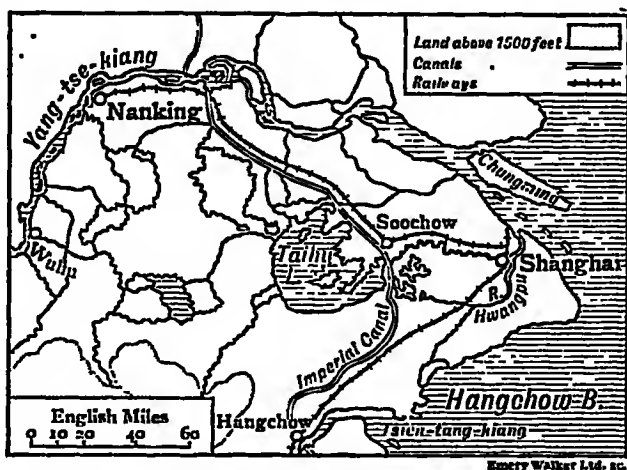


FIG. 101. THE MOUTH OF THE YANG-TSE AND THE POSITION OF SHANGHAI.

is now one of the world's greatest ports and has a population of more than three millions. It also has a considerable manufacture of cotton and silk.

Some two hundred miles up the Yang-tse, on its south bank, is situated *Nanking*, an old capital of China, and now regaining its old importance as the capital of the new China.

Other large and important towns of this plain are *Hangchow*, at the head of Hangchow Bay, and *Soo-chow*, on the railway from Shanghai to Nanking. All these towns are important for cotton or silk, and local industries are developing.

South-eastern China, consisting of the province of Fukien, and lying along the coast between the valleys of the Yang-tse and the Si-kiang, is a separate region. Its build, with its rather isolated valleys, has already been described. In addition to rice and tea, the hot wet climate gives a considerable production of tropical

fruits. The rugged nature of the country and the many harbours of the coast-line have led to a big fishing industry. The principal towns are the ports of *Foochow* and *Amoy*.

South China is made up of the plateau of Yunnan and the basin of the Si-kiang.

Yunnan is a mountainous region, difficult of access and inhabited by many tribes who are not of pure Chinese origin. It is mainly important for mining, agriculture being only possible in the narrow valleys. The main town is *Yunnan-fu*, from whence there is a railway to Hanoi in French Indo-China.

The *Si-kiang valley* is a tropical region. In the delta of the river are thickly inhabited alluvial lands. Up the valley all available level land is also intensely cultivated, but there is much mountainous land. Many of the mountains have important forests of camphor and lacquer, and tea is grown on the slopes.

On the delta stands *Canton*, always an important trading centre. An interesting feature of the town is the large population that dwells permanently in boats. Off the mouth of the river is the island of *Hong Kong*, ceded to Britain along with *Kowloon* on the mainland. On this island is the town of *Victoria*, and this has become the chief trading centre of Southern China, and it is a big *entrepôt* centre for the whole of the east as well.

Outlying Areas of China

In addition to China proper, the old Chinese empire included large areas of Central Asia. These have now either broken completely away from China, or are very loosely knit with her. They are, however, most conveniently dealt with in connection with China.

Mongolia really consists of two areas, Inner Mongolia and Outer Mongolia.

Inner Mongolia is the land lying immediately north-west of the Great Wall. It is a plateau area, with an undulating surface that is mainly covered with steppe grassland. Its climate, like most of Central Asia, suffers from considerable extremes. Despite this the land available has attracted a large number of Chinese settlers who

cultivate a variety of grain crops. With irrigation this area will become fertile and important.

The principal towns are *Kalgan* and *Paotow*, which are connected by rail with Peiping, and from them old caravan routes cross the deserts.

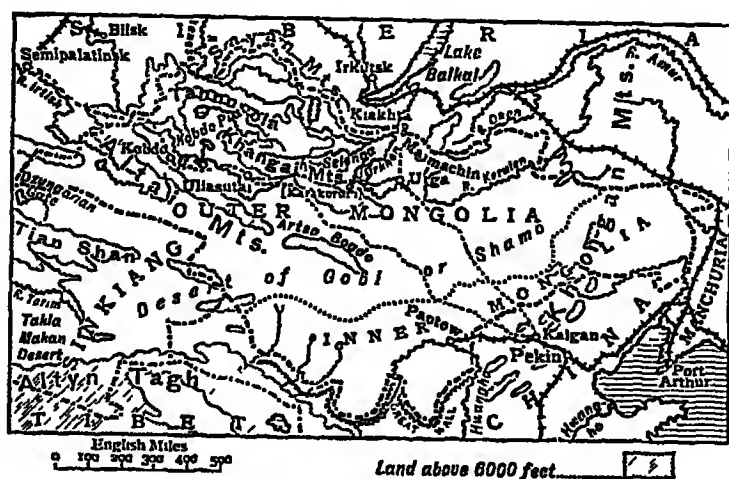


FIG. 102. MONGOLIA.

Outer Mongolia established itself as an independent Soviet Republic in 1924 and is under Russian rather than Chinese influence. In the south it consists of the *Gobi Desert*. It is a land of dried up basins of inland drainage, with a poor infertile soil, and only sufficient patches of poor steppe to support nomadic tribes, who move with their felt-covered lattice work "yurts" or tents from one region to another in search of water and pasture for the animals that form their only source of wealth.

In the north lies a rather better watered region, which stretches from the *Khingan Mountains* in the east to the *Khangai* and *Altai Mountains* in the west. These mountains have more rainfall than the plains so that pasture lands are richer along their footlands. Rivers drain northward, the headwaters of the *Yenesei* in the west, and the *Selenga* and *Kerulen* draining to Lake Baikal and the Amur

respectively in the east. The inhabitants are mainly nomadic herdsmen, and the towns are settlements along the caravan routes that followed the better watered lands along the edge of the mountains. The chief town is *Ulan-Bator (Urga)* which has a motor service to Kalgan, and is a fairly important trading centre. Before the building of the Trans-Siberian railway these routes were important for the transport of tea from China to Russia.

Sinkiang, which was once known as Chinese Turkestan, is made

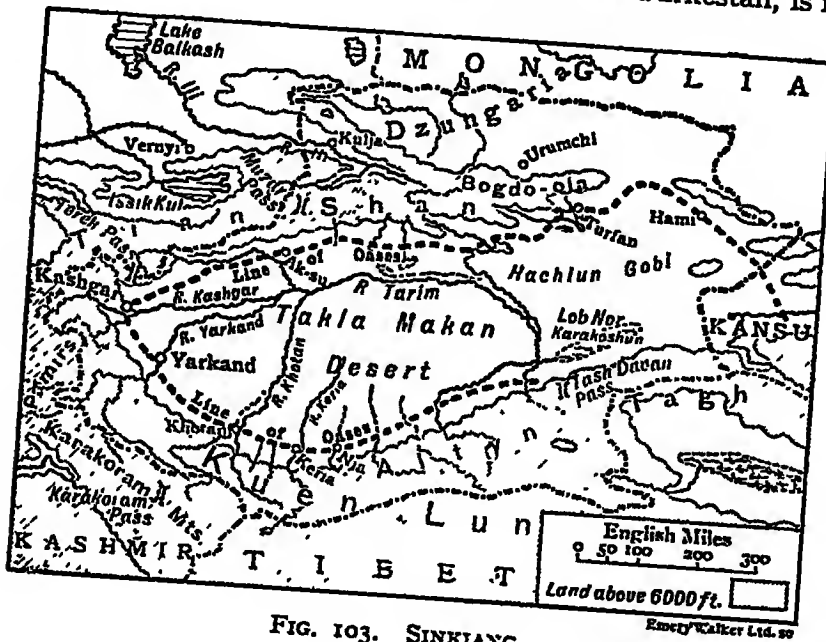


FIG. 103. SINKIANG.

up of two rather similar basins, the *Dzungarian basin* between the *Altai* and the *Tien Shan*, and the *Tarim basin*, enclosed by the *Tien Shan*, the *Kuen Lun* and the *Pamirs*. The mountains provide water for streams which eventually disappear in the desert hearts of the basins. At the foot of the mountains is a gravelly area of material brought down by the streams, and in the centre of the basins is desert land, but between these desert zones is a fertile rim, and in it are areas producing *cereals* and *fruits*, while *cotton* growing is being developed. The main towns are trading centres on the

caravan routes that followed the line of fertile lands. Chief of these are *Kashgar*, *Yarkand*, *Kuldja* and *Urinchi*.

Tibet.—This is the least known of the Chinese dependencies, for it is only in the last few years that Europeans have been allowed to enter the country.

Physically it consists of an enormous upland area lying in the centre of the continent. The most important part of the country is the valley of the *Tsan-po* (Brahmaputra) which runs roughly east and west to the north of the Himalayas. Here are situated *Lhasa*, the capital, and the chief "Lamaseries", the homes of the Lama priests who really control the country. This valley is some 12,000 feet above sea-level, but the river is navigable for some distance, and crops of *barley*, *vegetables* and even *fruits* can be grown on the river plains.

Stretching north from this valley to the *Kuen Lun* ranges lies a region known as *Chang Tang*, containing high valleys and even higher ridges, with a general elevation of some 15,000 feet. Scattered over it are many glacial and salt lakes, but agriculture is impossible. The few inhabitants rear *sheep* and the heavy *yaks* that form the main transport animals. In the north-east, between the *Kuen Lun* and the *Nan Shan*, lies the *Tsaidam basin*, a desert region of inland drainage.

The eastern borders of the country contain the deep cut north to south valleys that contain the head streams of the *Salween*, *Mekong* and *Yang-tse*, a forested and fairly fertile country. *Tatsien-lu* is a trading centre between China and Tibet.

Manchukuo

Until 1932 Manchuria was regarded as a Chinese province, but then Japanese influence led to its severance from Chinese control and the establishment of an independent country known as Manchukuo, very much under Japanese influence.

Build and climate.—It contains three distinctive areas. In the west is the upland area of the *Khingán Mountains*, which form the borderland of Mongolia. These are of old rock and are considerably eroded. There are important reserves of natural forest. In the

north the *Little Khingan* stretch eastwards from the main chain. In the east are other mountains, also old, worn down, and forested, which terminate in the peninsula of *Liaotung*. Between these mountains, which converge to the south, are two regions of plain, the plains around *Liao-Ho* in the south and the plains in the north, drained by the *Sungari*—a tributary of the *Amur*.

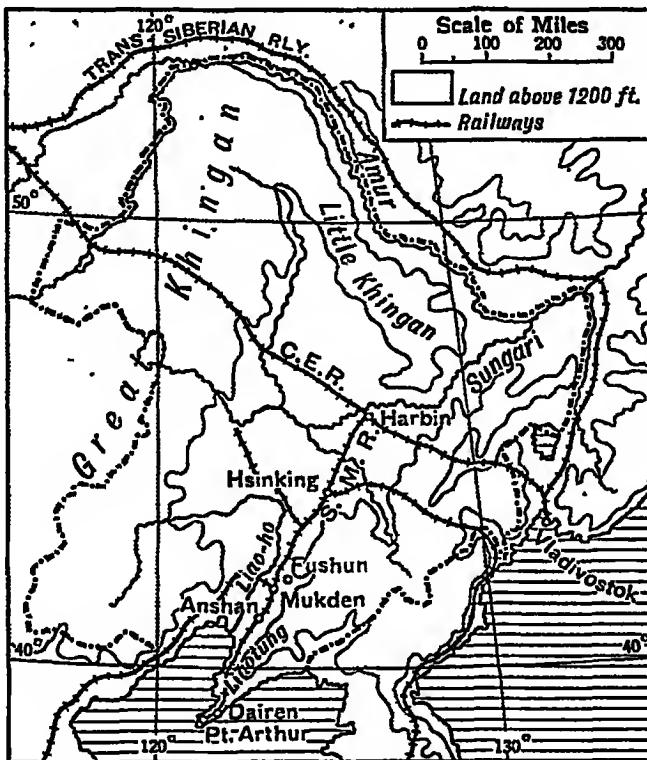


FIG. 104. MANCHUKUO (MANCHURIA).

The climate of the whole area is extreme, the severity increasing towards the inland regions of the Khingan Mountains. The typical monsoon characteristic of a summer rainfall, and the short growing period of some five months or so, have important effects on agriculture.

Development.—In the present century Manchuria has been a magnet to the surrounding peoples, and particularly to those of the

overcrowded lands immediately adjacent. Large numbers of Chinese have-migrated to the region and have opened up the plains in much the same way that Europeans opened up the plains of America last century.

The main crops are *millet*, *kaoling*, *wheat*, *barley* and *soya bean*, and it is the soya bean that has proved the most important, as it has provided a rich cash crop to enable the country to be opened up.

The *timber* of the mountains is also a valuable natural resource, though it is in danger of being exhausted. There is considerable *mineral wealth*. The principal minerals are *coal*, which is mined chiefly at *Fushan* and *iron ore* which is obtained at *Anshan*, both of these being situated in the eastern mountain area.

The country has benefited by outside enterprise. The Russians built the *Chinese Eastern Railway* (since sold to Japan) in order to have a direct route to Vladivostok, while the Japanese constructed the *South Manchurian Railway*, and did a great deal to open out the country from their base on the Kwangtung Peninsula. It is the vast potentialities of the country that have made Japan wage two wars for its control. The Japanese cannot settle in it, but it can supply Japan with food and raw materials and a market for manufactured goods.

The main towns are *Mukden*, the old capital, which is connected by rail to Peiping, and Port Arthur, the Japanese port on Kwantung, while a railway also runs northwards to *Harbin*, an important route centre, where the Chinese Eastern Railway crosses the Sungari. Along this line is the new capital of *Hsinking*, which has a railway eastwards to Korea.

EXERCISES ON CHAPTER XXXI

1. Write a short geographical account of Manchuria, indicating the reasons for its importance to (a) China, (b) Japan. (S.L.C.)
2. Explain why Tibet and the lower Yang-tse-kiang valley exhibit striking differences in (a) resources, (b) occupations, (c) density of population. (C.S.C.)

3. Explain the reasons for the growth of the following towns: Canton, Shanghai, Hankow (Wuhan), Peiping. Illustrate your answer with sketch maps.

4. Describe and explain the differing types of agriculture found in the Si-kiang valley, the Red Basin of Szechwan, and the loess area of the Hwang-ho.

CHAPTER XXXII

INDIA

Position and Build

INDIA is frequently described as a "sub-continent," a description justified both by size and situation, for it stretches from 8° to 37° N. and from 67° to 100° E., if Burma is included, and, lying entirely to the south of the vast fold systems, it is almost entirely shut off from the rest of Asia.

Northern folds.—It is possible to distinguish three main physical areas. In the north are the folds of the *Himalayas* and the adjacent ranges. The Himalayas stretch along the northern border in a great convex curve from the *Pamirs* in the north-west to the point in the east where the ranges strike southward to form the north-south ranges of *Burma*.

In the north-west *Kashmir* contains not only the Himalayas but also the *Karakoram* ranges lying to the north, with the fertile *Vale of Kashmir* and the upper Indus valley lying between them. For the rest of the way the frontier mountains form the most completely effective mountain barrier in the world.

Stretching south-west from the Pamirs are the *Hindu Kush* and *Sulaiman* Mountains, only less effective as barriers than the Himalayas themselves. This region is the famous "North-West Frontier" and has been the only practicable land entry into India throughout

history, routes coming in either along the coast, or through the *Bolan* and *Khyber Passes*. It should be borne in mind that, difficult as this entry is, it has allowed of entry, and successive waves of

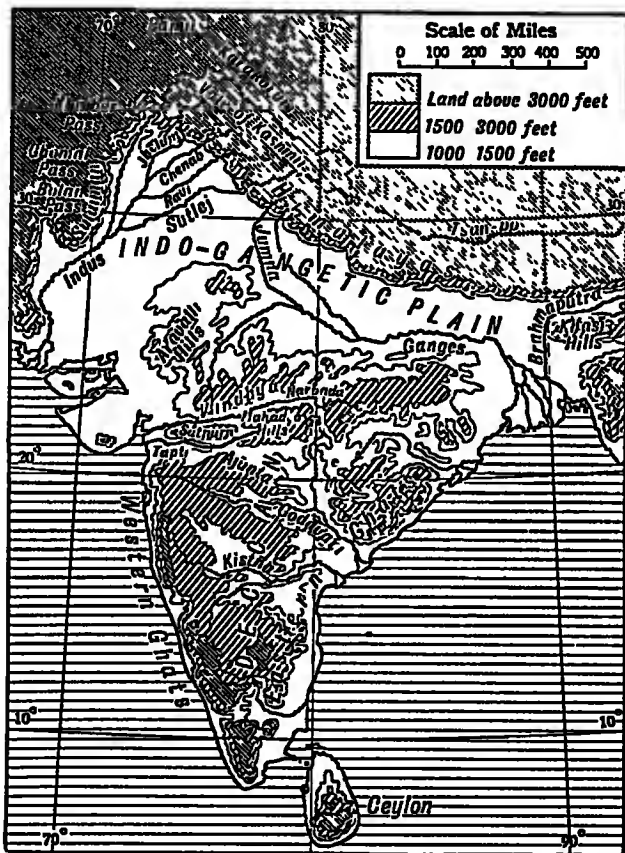


FIG. 105. INDIA—PHYSICAL FEATURES.

culture and civilization have swept into India by it, whereas the north-eastern frontier, for structural and climatic reasons, has proved practically impassable, and as a result there has been little communication between Indian and Chinese civilizations.

Southern India.—In the south lies the peninsula of India, occupied largely by the *Deccan* plateau. This region can be described as a triangle with its base roughly along latitude 25° N. and its apex pointing southwards.

It is one of the isolated remnants of the old "Gondwanaland", and it presents many features similar to the other remnants of that old land-mass. Both along the east and west the ascent to the plateau is steep and the edges are marked by high ridges—the *Eastern* and *Western Ghats*. The plateau as a whole tilts from west to east, so that there is a narrow coastal plain in the west and a broader one in the east, while the chief rivers, the *Godavari* and the *Kistna*, drain eastwards. In the north this drainage system is reversed. Running east to west are a series of sharply defined ridges, forming the *Vindhya* Mountains, the *Satpura* Hills and the *Ajanta* and *Mahadeo* Hills. Between these lie the deep and narrow *Narbada* and *Tapti* valleys, which drain westwards. This strongly marked east to west structure system has been very important in shutting the Deccan off from the rest of India.

Just to the south of this region the centre of the Deccan is covered with vast outflows of *lava*, which have weathered to form a very rich soil.

In the extreme north the line of the *Aravalli* Hills extends north-eastwards and, at about longitude 77° E., the gap between the Himalayas and the Deccan is less than 200 miles broad, and this has formed an important gateway.

The plain.—Between the two highland systems lies a trough, which has been filled in with recent sediments to form the *Indo-Gangetic plain*.

In the west is the area drained by the *Indus* and its tributaries. In the angle between the Sulaiman and the Himalayas is the *Punjab*—or "land of five rivers"—the *Indus* and its tributaries the *Jhelum*, *Chenab*, *Ravi* and *Sutlej*, all fed by the rain and melting snows of the mountains and gradually losing volume as they flow south-west to form the one main stream crossing the deserts. Between the rivers lie fertile lowlands known as *Doabs*. It is in this region that modern engineering has created vast irrigation schemes.

The *Ganges* flows south and east, between the Himalayas and the Deccan, and is fed by many streams, particularly from the former. Its main tributaries are thus on its left bank, and the *Jumna*, its main right bank tributary, has itself risen in the Himalayas. The river eventually turns south to form a vast delta at the head of the Bay of Bengal, and this delta is joined by the *Brahmaputra*, which, after a long west to east course as the Tsan-po in Tibet, breaks through the Himalayas in a series of vast gorges and then flows east to west between the Himalayas and the *Khasi* Hills before turning south into the delta.

The combined valleys of the rivers form one of the world's greatest alluvial plains. The soil is so fine that it is said to contain nothing larger than a small pebble for hundreds of miles, so that it has been necessary for modern engineers to bring road metal from distant areas.

Climate

Shut off as it is by its vast mountain boundaries to the north-west, north and east, India has a well developed climatic system of its own. The mountain barriers play an important part in shutting it off from all the cold influences of Northern and Central Asia and in confining all the warming and moisture bringing influences of the Indian Ocean to India itself. Unlike other monsoonal countries, India has three marked seasons, and so good an example are they of climatic controls in operation that it is worth noting them each in turn.

The cold season lasts from *November* to *February*—"cold" being merely comparative, for only the extreme north-west has any really cool weather. The Himalayas shut India off from the intensely cold winds blowing off Central Asia, but North India itself is a high pressure area and there are off-shore winds. The main winds are the *north-east monsoons* which blow over the Bay of Bengal and Southern India. Rain falls in the south-east as the result of these winds and there is slight cyclonic rain—possibly from the tail end of cyclonic influences from Europe—along the foothills of the Himalayas.

The hot season extends from the end of *February* to the end of *May*. The sun gradually gets overhead and the land becomes intensely heated. There are slight on-shore winds round the coast, but the low pressure system forming over the Indus valley is not

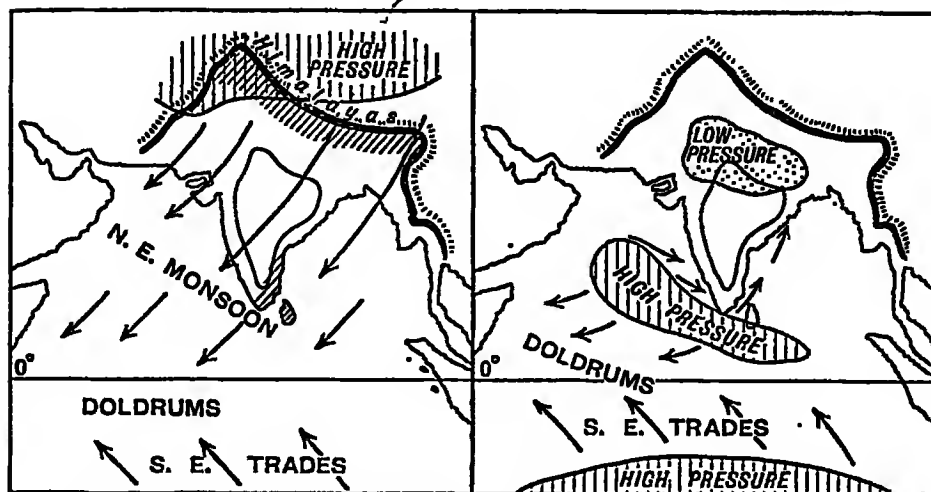


FIG. 106 (a). COLD SEASON—WINDS AND RAINFALL.

FIG. 106 (b). HOT SEASON—WINDS.

Note the high pressure off the coast.

yet intense enough to cause the inblowing monsoon. There is a slight high pressure system off the coast which prevents winds blowing in from the South Indian Ocean (see Fig. 106b). Eventually the high pressure ridge off the coast disappears, and when this happens the winds can instantly sweep in, justifying the description, the *Burst of the Monsoon*, for the onset of the rainy season.

The rainy season lasts from June to October. The "burst" is practically regular for any given place, and takes place first in the south and then spreads inland. The dates of the normal "burst" at various places are shown on Fig. 107, which also shows the distribution of the monsoonal rainfall. As will be seen, the heaviest rainfall occurs on the slopes of the Western Ghats, the Himalayas and the hills of Burma and Assam, *relief* being thus the determining factor.

Where the narrow valleys and steep slopes of the Khasi Hills force the moist air to rise with exceptional rapidity rainfall is exceptionally high, and at *Cherrapungi* reaches the world's highest, with an average of 450 inches per year.

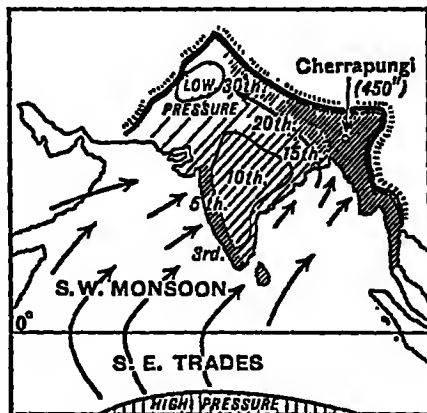


FIG. 107. WET SEASON WINDS AND RAINFALL.
Dates are for June and show normal date of the "Burst of the Monsoon".

Note—(i) relationship between relief and rainfall ;
(ii) winds deflected left up the Ganges Valley.

The barrier of the Himalayas and the marked low pressure over the upper Indus valley cause air currents to swing westward up the valley of the Ganges, along which rainfall diminishes steadily from east to west.

The Indus valley has only the very edge of the Arabian Sea branch of the monsoon, and is practically rainless, and the Thar desert is exceptionally dry. High temperatures, which make the air very dry, help to cause this aridity.

As the season advances the low pressure system begins to fill up, and the monsoons lose their intensity. Their influence ceases to penetrate so far inland and the rainfall gradually ceases, rain persisting longest on the coasts. This is the period of the *retreat of the monsoon*. Much of the rain of the south-east coast is associated with this period.

Vegetation

The heavy rainfall brought by the monsoon leads to a considerable amount of forest—particularly in hill areas. In the very wet regions of South-East India and Assam there are forests of equatorial type, but over much of the region more open deciduous forests are found, while on the high ground coniferous and temperate trees are met with. There is a certain amount of grassland on the Deccan, but India is not a region of pasture lands. In the plains, where the rainfall is sufficient for good vegetation, agriculture has led to practically all the land being cleared of its natural vegetation cover to make room for crops.

People

Some account of the people of India has already been given in Chapter XXVIII. From this it will be realized that the make-up of the population is so complicated as to be a further justification of the name "sub-continent" rather than country, as applied to India. Its population of some 352 millions, which makes it second to China in total population, cannot be in any way compared with that country. Whereas China has a considerable measure of racial unity, India has three important factors giving rise to a very diverse population.

Racial origins were dealt with in Chapter XXVIII, and it is sufficient just to mention that Southern India is inhabited largely by the more primitive *Dravidian* and *pre-Dravidian* peoples, while the north has peoples of the *Indo-European* type.

Language is a much more potent dividing factor. It is estimated that there are in India nearly 150 different languages—though some of these are spoken by only small groups. Consequently, English has become important as a common language.

Religion is the third and the most difficult to overcome of the dividing influences. The largest religious group are the *Hindus*, whose "caste" system has become so rigid that in itself it has proved a handicap to unity. Next in importance are the *Mohamedans*, who are found mainly in the north-west. Unfortunately there is a great amount of bitterness between these two groups. The *Sikhs*

are also found in the north-west, and there are several minor religious groups scattered about the country.

Government

Since its conquest by European nations and the final emergence of England as the ruling power in India, first through the East India Company and then direct through the Government, India has had a dual system of government. There have been a series of large provinces under direct British rule and a whole series of native states, ruled by their own princes under a certain amount of control, and varying in size from states of the size and population of Hyderabad ($14\frac{1}{2}$ millions) down to states of a few square miles and a few thousand people. The present century has seen the gradual development of self-government in India, and the culmination of that development has now been reached. So far as distribution of population is concerned it is necessary to bear in mind that India is essentially an agricultural country and that only a small percentage of its people lives in towns. The greater part of the population is concentrated in the fertile and well watered lowlands of the Ganges valley and the east coast plains.

EXERCISES ON CHAPTER XXXII

1. What are the most important factors which determine the climate of India. (O. and C.S.C.)
2. What are the reasons for India being described as a "sub-continent"?
3. Discuss the importance of (a) latitude, (b) relief, on the climate of India.
4. Explain the variations of climate experienced within the Indo-Gangetic plain.
5. Explain the relationship between relief features and racial and cultural distributions in India.

CHAPTER XXXIII

INDIA

Productions and Occupations

Farming.—India is essentially a land of peasant farmers, mainly concerned with obtaining sufficient food for themselves from their small holdings. Food crops are therefore exceedingly important, and the distribution of these depends on climatic factors.

Rice is the main grain crop. It is grown in all the wet lowlands, the chief areas being the lower Ganges valley, and the coast plains of the peninsula, all regions with a rainfall of more than forty inches. Even in these regions irrigation is necessary. Canals from the rivers are used in the Ganges valley, while in the peninsula storage "tanks" or reservoirs to retain the water are made. By these means it is often possible to obtain two crops a year in the lower Ganges valley.

Millet is grown in drier areas, principally in the Deccan and in the middle Ganges valley, and to a lesser extent in the Punjab.

Wheat has become very important in the Punjab, where irrigation has led to a big increase in acreage. It is also grown in the middle Ganges valley and on the Deccan to a lesser extent. In all these areas it is a winter crop, being sown at the end of the rains and reaped early in the hot season. It has become more and more important as a food crop in India, but the Punjab area and the Indus valley are also important as exporters of wheat, the main export centre being *Karachi*. Indian wheat comes on to the European market at the end of winter.

Maize is grown in the middle Ganges valley and in the irrigated areas of the Punjab, but it is not of great importance as a food crop.

Sugar cane is grown in large quantities, India having the largest acreage of sugar cane in the world but, owing to her large consumption, there is no export. The chief region of production is in the Central Ganges valley.

Apart from food crops India has four important natural products which form the chief cash crops.

Cotton is grown in two areas and is the main cash crop. On the black volcanic soil of the Deccan behind *Bombay* there has for a long time been a large production of rather poor quality short stapled cotton. There is a certain amount of export from *Bombay*, but

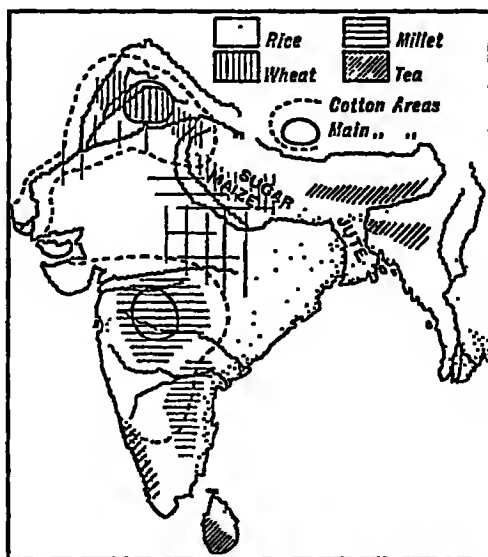


FIG. 108. INDIA—PRODUCTION AREAS.

much of the cotton is used at *Bombay* in the manufacture of cheap coarse cloths suitable for the local markets.

In the *Punjab* region irrigation has led to a large cotton production. In addition to short staple local types, longer stapled American varieties are grown and these form an important export from *Karachi*, which, unlike *Bombay*, has no local manufacture owing to its very dry climate.

Jute is another fibre crop. It is obtained from the stems of a plant after they have been soaked or "retted" in water containing a considerable quantity of humus. The plant requires similar climatic

conditions to rice, and this leads to a big production in the Ganges delta area, where there are also many sluggish streams suitable for retting. It is manufactured into coarse cloth, canvas and sacking and there are many jute mills in *Calcutta*, from which there is a considerable export, especially to Dundee in Scotland.

Tea is now an important product of the country, but it was only developed as a commercial crop in 1854. It is made by withering, fermenting and then drying the buds and small leaves of a shrub that grows best on wet but well drained tropical hillsides. For convenience the shrub is pruned to a height of some three to four feet. Picking has to be done by hand, and hence the large population of India has played an important part in making commercial development possible. The establishment of scientifically run plantations has enabled the Indian tea producers to supplant the more careless original Chinese producers as the chief suppliers of world markets. The principal producing centres in India are on the slopes of the hills of *Assam*, along the foothills of the Himalayas round *Darjeeling* and in the *Nilgiri* hills in South India.

Oil seeds, which were always grown in order to obtain oil for cooking and domestic purposes, have become important as cash crops in modern times, oils being exported for use as lubricants and raw materials. The main oil seeds exported are sesamum, linseed and ground nuts, the latter being of recent development.

Tobacco is produced in considerable quantities, but it is almost entirely used locally. It is grown in most areas, though it is of little importance in the Ganges valley.

Two crops for which India was once very famous have now become comparatively unimportant. *Opium*, grown in the central valley, is now only allowed to be exported in small quantities and production has therefore fallen off considerably. *Indigo*, a small shrub from which a blue dye is made, is grown in the lower Ganges valley, but the development of aniline dyes has practically killed this very ancient industry.

Mining and manufacture.—Mining is comparatively unimportant, only two minerals being produced in really important quantities.

Coal is mined very largely in the *Chota Nagpur* area to the north-east of the Deccan, the main mining centres lying around *Raniganj*. Small quantities are obtained in the *Godavari* valley in *Hyderabad* and in *Assam*.

Manganese is found in considerable quantities, especially in the *Nagpur* area of the central provinces, and in *Orissa* in the north-east of the Deccan, and round *Bellary* in the south of the Deccan.

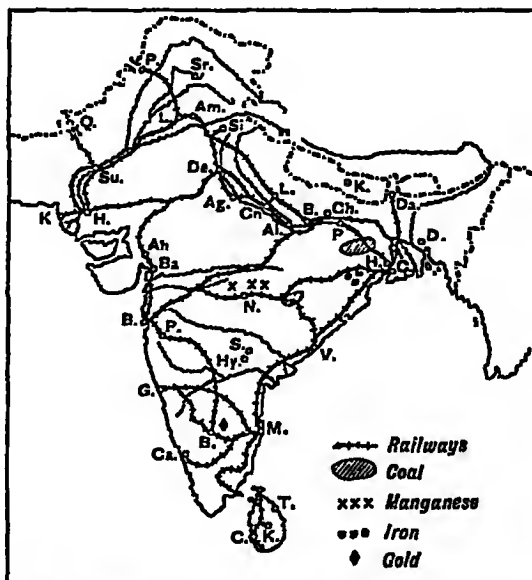


FIG. 109. TOWNS, RAILWAYS AND MINERALS OF INDIA.
Identify the towns.

Iron ore is mined also in the north-eastern area of the *Deccan*, with a smaller production in *Mysore* in the south.

India is the largest producer of *mica* in the world, production coming almost entirely from *Bihar* and *Orissa*. *Gold* is mined almost entirely in the *Kolar* district of *Mysore*.

From this account it will be seen that practically all the mineral wealth is concentrated in the Deccan rocks, and that there are three main mineral areas, most important of which is in *Bihar* and *Orissa*

in the north-east of the Deccan, the other two being Mysore in the south and the Nagpur district.

In recent times a start has been made in the industrialization of India. There has always been a "home" industry, manufacturing cloth and implements, and even in modern times there is still a considerable amount of peasant industry, especially in the spinning and weaving of textiles.

Cotton spinning and weaving in modern factories is very important in *Bombay*, where there is a local supply of cotton and a suitable climate. The absence of local coal has been overcome by import and, more recently, by the development of hydro-electric power. The cloth produced is the cheap coarse cloth that will find a market locally.

Jute manufacture is important in Calcutta, where again local supplies are grown, coal being fairly easily obtainable in this case. There is a considerable *silk manufacture* in both Bombay and Calcutta, raw silk being imported. Woollen industries, as might be expected, are unimportant, except for the shawls and carpets of the Punjab and Kashmir districts.

Iron and steel manufacture has been developed very recently in the *Chota Nagpur* area by the famous Tata iron works, which use the iron and coal found in this region.

EXERCISES ON CHAPTER XXXIII

1. Select three important exports from India to Great Britain. In what parts of India are they produced and under what conditions?

(C.S.C.)

2. Give a brief description of the climate, productions and industries of the Ganges valley. Illustrate your answer with a sketch map.

(S.L.C.)

3. Compare wheat cultivation in the Punjab with wheat cultivation in Canada.

(From S.L.C.)

4. Name three different manufacturing industries of India. For each industry describe the position of the most important centre of manufacture and the factors favourable to it.

(C.S.C.)

5. Give an account of the distribution of agriculture in the Indo-Gangetic plain. State the main crops grown and the conditions under which each is grown most favourably?

(C.S.C.)

CHAPTER XXXIV

INDIA

Natural Regions and Towns

THE three physical areas of India—northern fold mountains, Indo-Gangetic plain, and Deccan—form the basis of any division into natural regions. The sub-continent can be divided into a very large number of quite clearly distinguishable regions, but it is only possible to indicate the broad divisions here.

The northern mountains are really important as the boundary areas. The eastern portion, so far as India is concerned, is merely the south facing slopes of the Himalayas, and these are partly occupied by the independent state of *Nepal*. The hill areas of *Assam* can be included in this region. Along the wet foothills the heavy rainfall gives rise to dense tropical forest known as "terai", which gives place up the slope to deciduous and then coniferous forest. In certain districts, especially in Assam, tea growing is important, while the main centres of habitation are in the more sheltered valleys. The chief town is *Darjeeling*, one of the British summer resorts, and on an important route to Tibet. *Katmandu* is capital of Nepal. Railways from Calcutta reach Darjeeling and the Brahmaputra valley.

The *Western Mountains* are drier, and the Indian boundary extends further into them, so as to include the Karakorum Mountains and *Kashmir*. The valleys are the centres of population, the most important being the Vale of Kashmir, a very fertile one in which is situated the town of *Srinagar*. *Simla*, the summer capital of India, is situated in this western area.

The *North-Western Mountains* are important as containing the main land routes into the country. Otherwise they are wild and arid regions, the home of fierce tribes whose constant raids into the fertile plains have led to the building of roads and railways into the

area, and to the establishment of frontier towns to guard the passes. *Peshawar* guards the famous *Khyber Pass* that leads to Afghanistan in the extreme north-west. Further south is *Quetta*, controlling Baluchistan and the routes through the *Bolan* and *Khojuk Passes*, while in between these two main routes is the lesser route through the *Ghomal Pass*.

The inhabitants rear sheep and goats, and, here and there, manage to cultivate fields by means of water brought underground from the foot of the hill slopes.

The Indus valley.—This valley has two main areas—the upper region of the Punjab, with its fertile *Doabs*, and the desert and semi-

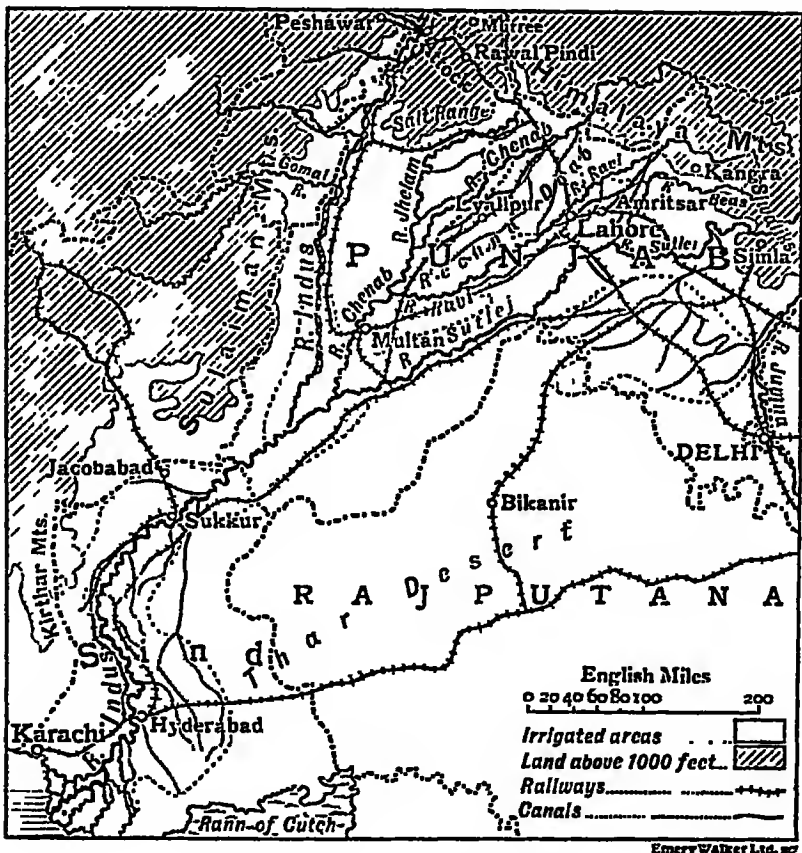


FIG. 110. INDUS BASIN.

desert area of its lower course. The *Punjab* is the main centre of modern irrigation works, and wheat and cotton crops are grown. *Lahore* is the capital of the province and an important railway junction, *Amritsar* is the centre of the Sikh religion, and *Multan* is the main commercial centre of the lower Punjab.

The *lower Indus valley* depends on irrigation, and is being developed by the big *Sukkur* barrage. Only a narrow strip of land can be cultivated here, the rest of the *Sind* being desert, which to the east merges into the *Thar desert*, a very marked barrier between east and west.

The main town is *Karachi*, the big modern port to the west of the delta, which has grown up with the opening of the Suez Canal, the building of a railway direct to the Ganges valley, and the development of the export of wheat and cotton from the Indus valley. *Hyderabad* is at the point where railway routes cross the lower Indus above the delta.

The *Ganges valley*.—This is a unit in as much as it is the valley of a mighty river. It is entirely composed of alluvial soil and is almost entirely occupied by agriculturists. Conditions of life are not uniform all over the region, however, and the variations again give an example of climatic control on occupations. As it was shown in the description of India's climate, the monsoon blows up the valley, and consequently rainfall decreases in amount and in length of season according to distance from the sea.

The *Delta* area, roughly the province of *Bengal*, has a very wet climate and the main crops are rice, jute and oilseeds. Two crops of rice a year are obtainable, and a third food crop is often grown. Population is exceedingly dense, save in certain deltaic areas where swampy conditions prevail, and along the sea coast of the delta, where there are the forests known as the *Sundarbans*.

Going up the river the rainfall diminishes and temperature ranges become greater. In the central portion, forming the province of *Bihar*, irrigation of the fertile Doabs becomes more necessary, and, while two crops of rice are still grown, millet, wheat and barley become more important. Higher up, in the *United Provinces*, irrigation becomes more important still, and there is a much greater

diversity of crops. Sugar is important, while rice gradually gives place to wheat, barley and millet, and cotton is an important cash crop, particularly in "The" Doab between the Ganges and the Jumna.

Population is dense throughout the area, but it is mainly agricultural and the towns are comparatively small. Some, however, have grown to be places of considerable size and importance. At

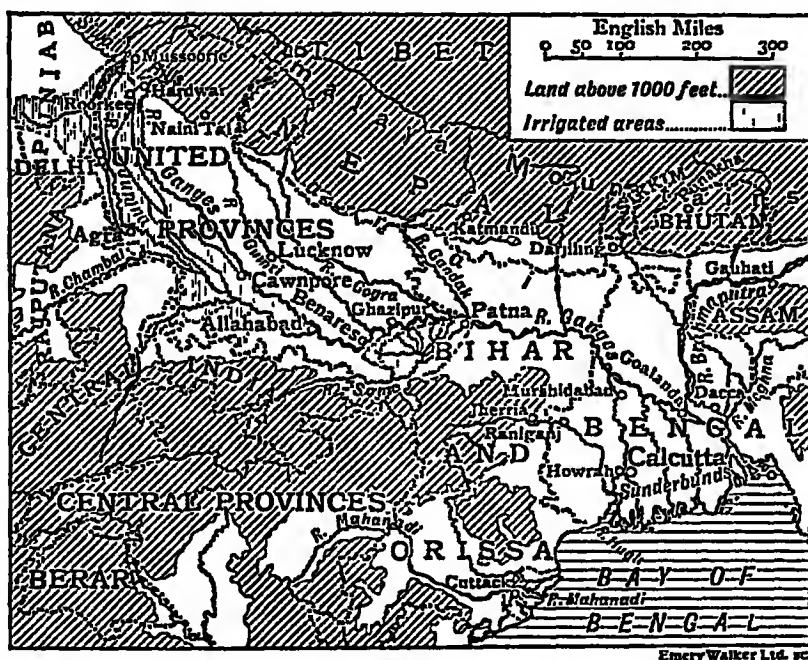


FIG. III. GANGES BASIN.

opposite ends of the valley are situated the old and the new capitals of India.

Calcutta, on the Hooghli distributary, occupies a commanding position with regard to the sea-borne trade of the valley, and for long was the capital. This is natural in view of the fact that the English, who reached India by sea, would want their capital so placed as to command the most important part of the country. It still remains the commercial capital of the country. Opposite it is *Howrah*, from which the railways westward start, and which has

grown in importance with the opening up of the Chota Nagpur mineral area.

Delhi, the present capital, commands the land route into the Ganges valley, lying in the gap between the Himalayas to the north and the Thar desert and the Aravalli Hills to the south. Its central position in the Indo-Gangetic plain, and an easy route south to the peninsula via the Chambal valley, led to its being created capital of modern India in 1912, but the historical importance of its position is shown by the ruins of ancient capitals, built by previous conquerors, that lie round the modern city.

The building of railways and the development of modern industries has led to the growth in importance of several old towns. *Allahabad*, the capital of the United Provinces, is an important railway centre, and is also a place of pilgrimage, though not so sacred as *Benares*, the most important religious centre on the sacred Ganges. *Lucknow*, the old capital, is giving place to *Cawnpore* in importance, as the latter is a big railway centre and the seat of important leather industries.

Patna and *Chapra*, the main towns of Bihar, are important rice centres but, since the coming of railways, have declined in importance, as they are not on the main route from Delhi to Howrah. *Dacca*, on the Meghna delta, to the east of the main delta, is important as a jute centre.

The peninsula.—This is too vast to be considered entirely as a whole. The build of the area causes distinct differences to arise as between coastlands and plateau, and yet at the same time the development of certain coastal towns as ports has been influenced by the development of the plateau.

The west coast has two distinctive areas, the broad lowlands round the *Gulf of Cambay*, in the north, a region including the valleys of the Narbada and Tapi, and the narrow coastlands of the south, chief of which is the *Malabar Coast* south of Portuguese Goa.

The land round Cambay country is a transitional area between the dry infertile lower Indus plains and the well watered fertile volcanic areas in the north of the Deccan. West of the gulf the land is comparatively infertile, wheat and millet being the chief crops.

East of the gulf fertile soil is found and rice and cotton are grown. The ports of the gulf have been silted up and are unimportant as compared with Bombay.

Ahmadabad and *Baroda* are important old centres that have modern cotton mills to manufacture the local short-staple cotton.

The coastlands to the south are narrow and well watered, the most fertile lands lying round a series of lagoons that run parallel to the coast. On these lands rice is grown, while along the sandy coastlines coconut groves are important. The slopes of the Western Ghats are wet and forested. Timber is important, while in the south tea and coffee are grown. The nature of the coastline and the strong winds of the S.W. monsoons have handicapped the growth of ports, though by linking up the lagoons transport along the coast has been made easy.

Calicut and *Goa*, the original ports developed by the Portuguese pioneers, are now of little value, though the former is important because of the railway westwards via the *Palghat Gap* between the *Nilgiri Hills* and the *Anaimalai Hills*.

The *east coast* also has two main areas, the *Golconda Coast* of the north and the *Coromandel Coast* of the south. Both these coastlands have a more evenly distributed rainfall than the rest of India, as they receive rain during the "retreat" of the monsoon and from the N.E. winds of winter.

The *Golconda* coastland area is narrow and unimportant save in the fertile areas at the mouths of the Godavari and Kistna rivers, rice being the main crop in these lowlands, though it soon gives place to millet in the drier hill country. The only good harbour is at *Vizagapatam*, which will be developed now that the railway into the badly served north-eastern area of the Deccan is completed.

The *Coromandel* coast is the region of the "carnatic" and forms the Madras Province. The coastland area is rich and fertile and, with the aid of irrigation, many food crops are grown, and there is also a production of cotton which gives rise to manufacture at Madras.

The main town of the region is *Madras*, which grew up at a central point along the coast and, with fairly easy routes into the interior, became the chief commercial centre. A modern port has been

built, as the coast has no natural harbours, and there is an export of leather and cotton. *Trichinopoly* is the main inland centre.

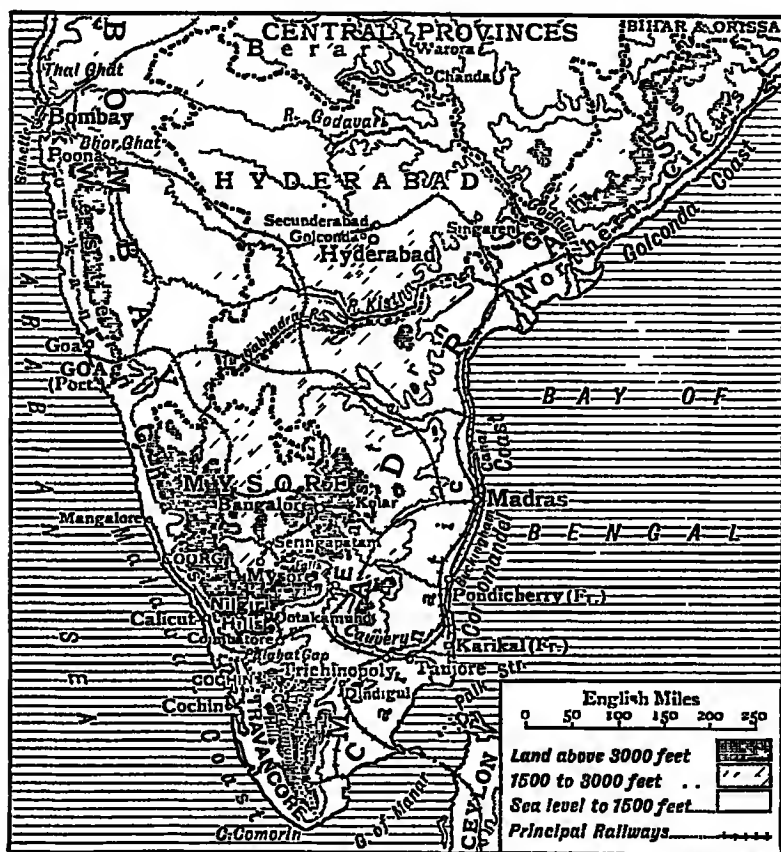


FIG. 112. INDIA SOUTH OF THE GULF OF CAMBAY.

The Deccan peninsula itself is a region of comparatively low rainfall, part of it lying in the rain shadow of the Western Ghats. Both Western and Eastern Ghats have a heavier rainfall and are forested regions. Except in the hilly north-eastern area, which is wet, forested and thinly peopled, millet is the main food crop of the

plateau. The most important area is the black soil area of the north-west. The lava soil retains moisture and so the low rainfall is more effective. Cotton and oil seeds form important cash crops ; there is a considerable local manufacture of cotton.

Further south the soil is less fertile, old hard rocks being found, and pastoral occupations become important (hence the leather export of Madras). In the wetter western areas of Mysore coffee growing is still carried on, though it is not of great importance nowadays, since the industry was ravaged with coffee disease at the end of last century.

The mineral productions of the region have already been considered. The chief towns are route centres. *Hyderabad* is capital of the large native state. It is close to the important rail junction of *Secunderabad*.

Nagpur is an important mining and cotton centre in the lava area. *Poona* controls a gap, the Bhore Ghat, in the Western Ghats behind Bombay, and *Bangalore* is the main route centre for the south of the peninsula and is the largest town in Mysore. The main town of peninsular India is *Bombay*. Built on an island which is now connected by rail to the mainland, it has the only good natural harbour in India. It owed its growth to the building of railways to the cotton areas and to the building of the Suez Canal. The first fact has led to its becoming the main cotton manufacturing centre of India, the second, in conjunction with the building of railways to the Indo-Gangetic plain and the development of steamships which were not dependent on the monsoons, has enabled it to rival Calcutta as the main port of India.

Railways.—The main India railways are shown on Fig. 109. The building of railways has been of great importance in many ways, for not only has it led to economic development but it has had big social effects. The improvement of transport has done much to lessen the dangers of the constantly recurring famines that were so common a feature in this land of densely peopled areas, for now food can be brought to the affected regions. The importance of the railways as factors in the unification of the sub-continent and its emergence as a region with a united future must not be overlooked.

Ceylon

Build and climate.—Lying off the south-east corner of India is the island of Ceylon, which is separated from the mainland by *Palk Strait*, and connected to it by a line of islands and reefs known as *Adam's Bridge*.

The island is pear-shaped, with high ground similar in structure to the mainland rising to a height of 8,000 feet in the broader south. The main area of plain is in the north, where there is a considerable limestone area.

Its position within 10° of the equator gives Ceylon a hot but equable climate somewhat tempered by its insularity. It has rain from both monsoons, the east coast receiving its maximum in winter from the N.E. monsoon, and the south-west a rather larger maximum from the S.W. monsoon. The northern area, having no high land to force the air currents to rise, has a low rainfall.

People and development.—The population, composed largely of *Cinghalese* (the natives of the island) and *Tamils* from the adjacent carnatic mainland, are essentially agriculturists, and the main food crop is *rice*. Ceylon, however, is not self supporting in this food crop as it produces large quantities of three important cash crops.

Tea is grown on the wet south-western hills from a height of about 2,500 feet upwards. This was introduced in 1867 after disease had played havoc with the originally developed coffee plantations. The main centres are *Kandy* and *Nuwara Eliya*.

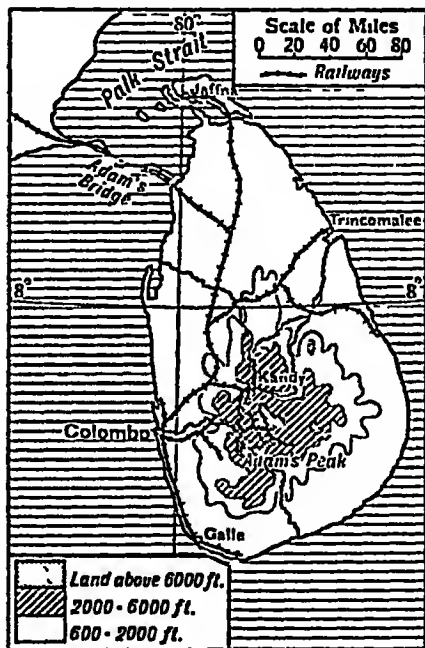


FIG. 113. CEYLON.

In the south-west, below this height, the coffee was replaced by *rubber* plantations at the beginning of the present century, and, after Malay and the Dutch East Indies, Ceylon is the third largest rubber producing country.

Along the sandy western coasts there are big *coconut* plantations leading to a large export of *copra* and *coir*.

Apart from these three main products, the west grows *cinnamon* and other spices and *areca* nuts, while the north produces *tobacco* and *palmyra* nuts.

There is a considerable mineral wealth, but only certain precious stones, especially *sapphires* and *graphite*, are produced in any quantities.

Towns.—The old capital was *Kandy*, in the hill country, but the main town in modern times is *Colombo*. This is situated on a good harbour on the west coast and occupies a most important position with regard to the routes of the Indian Ocean, being at the crossing point of the Suez—Hong Kong and Australia route and the Cape Town—Calcutta route. *Trincomalee* in the north-east and *Galle* in the south are old ports, the former being a modern naval harbour. *Jaffna* in the north has a local trade with the Coromandel Coast.

EXERCISES ON CHAPTER XXXIV

1. The central part of the Congo basin, with an equatorial climate, has on an average about 10 people to the square mile. Bengal, with a monsoon climate, has over 600. How do you account for this difference?
(S.L.C.)
2. Contrast from a geographical point of view human activities in a monsoon country such as India with those in a region of the southern hemisphere with a Mediterranean type of climate.
(S.L.C.)
3. Describe the relief, climate and resources of Ceylon.
(C.S.C.)
4. Write an account of India south of 20° N. under the headings (a) physical features, (b) climate, (c) occupations of the people.
5. Discuss the facts that have led to the growth of the main ports of India, and estimate their relative importance.
6. Draw a sketch map of India, indicating and naming the main climatic regions. Choose *two* of these regions and show how the occupations of the people are related to physical and climatic features.
(C.S.C.)

CHAPTER XXXV

SOUTH-EASTERN ASIA : INDO-CHINA AND THE EAST INDIES

BETWEEN India on the west and China on the east lies the peninsula of Indo-China, tapering to the south, and linking up in many ways with the islands that lie on the continental shelf which projects south-eastwards from Asia to Australia.

This entire region can be treated as a whole inasmuch as it is a transition region between the two main population centres of Asia. It is at once a divide and a meeting place, for it contains physical features that shut off India from China and the sea route that links east with west, the Pacific with the Indian Ocean and so with Europe via the Suez Canal.

The peninsula.—To the west of the Tibetan plateau the east to west structure lines of Central Asia give place to a sharply defined north to south direction. East of the Brahmaputra gorges the fold systems swing south and form the *Arakan Yoma* of Western Burma; east of the folds lies a series of plateaus. Those of Western Tibet, Szechwan and Yunnan have already been dealt with in the chapter on China, and they should be remembered as the almost impassable barrier between India and China. South-west of Yunnan lies the *Shan plateau*, and south-east from this lie the *Laos plateau* and the *Annamite mountains*. These plateau systems form the core of Indo-China, and the long narrow *Malayan peninsula* is a southward continuation of this old rock area.

The region is drained by several big rivers. Just to the west of the Tibetan plateau the *Salween*, *Mekong* and *Yang-tse-kiang* flow south in deeply cut parallel valleys only a few miles apart. At about 27° N. the Yang-tse is forced eastwards by the Yunnan plateau, and

the Salween and Mekong diverge to flow to the Bay of Bengal and the South China Sea respectively. The *Irrawadi*, and its tributary the *Chindwin*, drains the area between the Shan plateau and the Arakan Yoma. The *Menam* flows south from the Shan plateau and forms the alluvial lowlands of Siam, and the *Sing ha* (or Red River) drains the Tongking area between the Laos plateau and the south-eastern spurs from Yunnan that form the southern boundary of China.

The islands.—The young fold area of Western Burma reappears to the south in the mountainous backbone running eastward through the East Indies. This mountain backbone is situated to the south-east of *Sumatra* and to the south of *Java*, and to the north of it lies a narrow plain of recent material. In Java the volcanoes associated with the young folds have also led to a region of fertile hill country. The other islands, *Borneo*, *Celebes* and the *Philippines*, are formed of fold systems that sweep northwards and link up with the folds of Japan.

Climate.—As this region extends from 10° S. practically to the Tropic of Cancer there are considerable climatic variations, but it is possible to distinguish two main climatic regions.

The extreme south of the peninsula—*i.e.* Malaya—and all the islands except the Philippines, have an *equatorial* type, modified by insularity and with rainfall distribution being partly affected by position—northern and eastern regions having most rain in January when the north-east monsoon is blowing, and southern and western areas having most in July.

The main peninsula and the Philippines are more definitely *monsoonal*, rainfall coming mainly with the south-west monsoon (or southerly as it is in the Philippines) and January being the dry period, save on the east of Annam and the east of the Philippines, which get rain from north-east winds. The interior areas of the peninsula, owing to relief, have comparatively low rainfalls, this being particularly the case in Burma.

People and development.—The mingling of races at this point has been mentioned in Chapter XXVIII, and there is no need to repeat it. It should be added that in the heart of the Shan and Laos

plateaus there are primitive tribes unlike the surrounding Mongolian peoples.

This is also a meeting place of colonial empires, with the *British* in Burma and Malaya, the *Dutch* in the East Indies, the *French* in Indo-China, while the *United States* stretched across the Pacific in 1898 and further emphasized the position of the region by wresting the Philippines from Spain.

There are thus many types of colonial enterprise, and this has been built on a very varying native population. Throughout the area there is little uniformity of either civilization or density of population, as is evidenced by the Dutch regions, which include the thinly peopled parts of Borneo, the home of savage head-hunters, and Java, the home of a civilized native people, the most thickly peopled agriculture area in the world.

Occupations and productions.—As in all the other monsoon areas, *agriculture* is the predominant occupation of the native races, even though in certain regions this is only of a primitive nomadic type, which involves clearing a piece of forest land for crops and then leaving it to run to waste after a few years when the soil is exhausted. *Fishing* is also of great importance among the islands and in coastal and river districts. The advent of outside control, however, and the low density of population over much of the area has led to a considerable development of *plantations*, so that the region produces important cash crops.

Rice is the main food crop of the area, though it is in many regions supplemented with *maize* and *sweet potatoes*. It is grown in most regions and particularly in the fertile river valleys of the peninsula and the coastal lowlands of Java and the Philippines. In both these islands it is also grown in elaborately terraced fields on the fertile volcanic hillsides.

The greatest proportion of rice growing land is found in the peninsula, and Burma, which has rice mills at *Rangoon* and *Bassein*, Siam, and French Indo-China, with rice mills at *Cholon*, have a surplus for export, a good deal of which goes to Malaya, Java and the Philippines, where considerable areas are devoted to other crops.

Cane sugar is an important product of Java and the Philippines,

though the industry in both regions has been hit considerably by recent world conditions. In Java the sugar growing is carried on as a rotation crop in rice growing regions in the centre and the east,

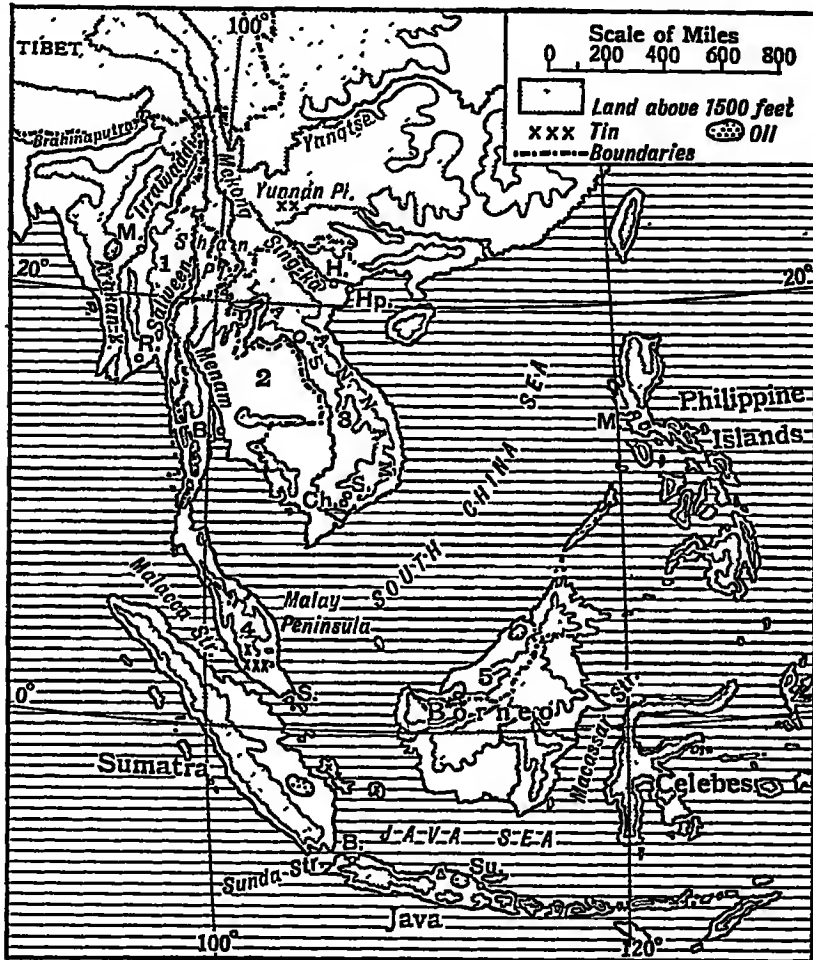


FIG. 114. SOUTH-EASTERN ASIA.

Identify States (numbered 1-5) and the towns that are marked.

the Government regulating the amount of land allowed to be used for it in order to ensure a sufficient food production for the large population.

Rubber is by far the chief cash crop of the region. Plants were brought into the region from South America via Kew Gardens and Ceylon at the end of last century, but real development has only taken place during the present century. The tremendous increase in the demand for rubber led to the growth of large plantations in Malay, established with British capital and worked largely by Tamil labourers brought over from Southern India. More recently, rubber growing has been developed in Sumatra, Borneo and French Indo-China. A modern factor has been the large development of rubber growing by natives in Malay and Sumatra and recently there has been a big slump in rubber prices which has necessitated action by the British and Dutch governments. There is quite a possibility that cheap native production may yet oust the plantation rubber from the market much in the same way that the latter ousted that of the Amazon area only a decade or so ago.

Copra is produced in the Philippines, Sumatra and Western Malaya, and these three areas, with Ceylon, produce the greater part of the world's supply.

Oil palms have been introduced in recent years, particularly to Sumatra, where there is a large area and a small population, and this region threatens to rival West Africa which, until now, has monopolized the palm oil trade.

Manila hemp or *abaca*, obtained from the fibrous leaves of a plant, is produced in the Philippines and, as the fibre is able to withstand the effect of sea water, it is used for making ropes for marine purposes. These are the main crops, but in addition Java produces *tobacco*, *coffee*, *tea*, *cinchona*—of which it now is the chief world producer—and *kapok* fibre. Malaya produces *pineapples*, French Indo-China, *cotton* and *silk*; and Borneo and the Philippines, *tobacco*. In the inland hill countries of the peninsula there are valuable hardwood forests, Burma and Siam both being noted for *teak* production.

Mineral wealth is considerable, but in many regions it is little developed, and there are only two really important mineral productions.

Tin is obtained from the old rock areas, especially from Malay

and the Dutch islands of Banka and Billiton. It is also mined in the narrow isthmus connecting Malay to Indo-China. The chief mining region is Malay, much of the tin being obtained by dredging it out of the alluvial deposits into which rivers have carried it from the mountains in which it has been formed. The tin is smelted locally at *Penang* and *Singapore*.

Petroleum, as it was pointed out in the section on South America, is found associated with regions of recent folding. Along the line of young folds surrounding the old core of these regions are important oil producing areas. In Burma a series of oil fields is found along the Irrawadi valley from *Mandalay* to *Magwe*, near which is the main oilfield at *Yenangyaung*. There is a pipe line to Rangoon. Oil is also produced in the south-east of Sumatra in the *Palembang* area, in Eastern Java behind *Rembang*, and in Borneo. In the last named there has recently been a considerable oil production from *Sarawak*, the state ruled by the descendants of the English Rajah Brooke, who here carved out a kingdom for himself in the first half of last century.

Coal is found in small quantities in Burma, near the oilfields in Sumatra, near *Kuala Lumpur* in Malaya, and behind *Haiphong* in French Indo-China.

Colonies and Towns, etc.

British areas.—Mention has already been made of the colonial development of the region. So far as the *British* areas are concerned it should be remembered that *Burma* has been attached to the Indian Empire but that the new constitution of India provides for its separation. The rest of the area is divided between the small isolated colonies grouped together as the *Straits Settlements*, and the protectorates of the Malay States and Sarawak and North Borneo.

By far the most important town in the area is *Singapore*. With the development of steam shipping through the Suez it controls all the trade passing from east to west through the area. It is the main collecting and distributing centre for the entire region, and is on the modern air route to Australia.

In Burma the main towns are *Mandalay*, the former capital, which occupies a central position for the Irrawadi and Chindwin valleys, and *Rangoon*, the main port and commercial centre, which lies between the deltas of the Irrawadi and the Salween and, by rail and river, controls the trade of the whole country.

Other areas.—*Batavia*, the chief Dutch town, grew to importance when sailing ships entered the area via Cape Town and the Sunda Strait, which it controls. It is still important as the main town of Java, and the chief port of the island. *Surabaya* is another important Javanese port.

Bangkok, the capital, a few miles up the Menam, is the only important town of *Siam*.

In *French Indo-China* the main towns are *Saigon* and *Cholon*, in the Mekong delta, and *Hanoi*, capital of the whole area, and *Hai-phong*, its port, in the Tongking region.

Manila, on the island of Luzon, is the capital and chief port of the *Philippine Islands*.

Other towns in the region are mainly small trading centres of purely local importance.

EXERCISES ON CHAPTER XXXV

1. Write an account of (a) the relief, (b) the climatic features, (c) the export trade of Burma. (C.S.C.)
2. Describe the geographical factors which help to account for the difference between the occupation of the inhabitants of the plain of North China and the Malay Peninsula (O.S.C.)
3. Describe the relief, climate and resources of Malaya. (C.S.C.)
4. In what respects do Rangoon and Singapore differ in (a) position and character of the port, (b) the nature and origin of their exports? (C.S.C.)
5. Write an explanatory account of the wealth of the Dutch East Indies in vegetable products, both natural and cultivated. (C.S.C.)

CHAPTER XXXVI

SOUTH-WESTERN ASIA

THE monsoon lands lie to the south and east of the vast mountain system of Asia, and so are shut off from the rest of Eurasia. Two regions form the connecting links between the monsoon lands and Europe. Throughout historic times the main bridge between the two areas of fertility has been the combined land and sea route lying to the south of the Himalayan-Alpine fold system—the route linking up the Mediterranean Sea with the Arabian Sea—a route of comparatively short land journeys and now having a through sea route via the Suez Canal. The other bridge lies to the north of the system and links up the far East with Eastern Europe, and is followed by the caravan routes across the outlying Chinese lands and further north by the Trans-Siberian railway. Since the south-western bridge area is the oldest, the more important and is more definitely individual, it will be considered first.

Build.—This region of South-Western Asia is frequently called the “Land of the Five Seas”, a name which emphasizes the manner in which sea inlets “bite” into the land and give a series of narrow land bridges.

Physically, the outlines of the region are simple. In the north, running first west to east and then trending south-east, lie the folds of the *Alpine system*, enclosing the high *plateaus* of *Anatolia* and *Iran*. In the south lies the *plateau of Arabia*, part of the old unfolded plateau system of the south, a region of old hard rocks and arid desert conditions. Between these two lies the depression occupied mainly by the valleys of the *Tigris* and *Euphrates*, a region of fertile soils and easy movement, along which nations, traders, and conquering armies have moved from time immemorial. For cen-

turies it was the battleground of the area, and rivalry for the control of it continued up to the present century.

Climate.—Lying, as it does, between the Mediterranean lands on one hand and the monsoon lands on the other, this area is a transitional region so far as climate is concerned. The western areas bordering the Mediterranean have the characteristic climate associated with that sea. As in most of the lands round the Mediterranean itself, the rainfall comes from cyclones in autumn and early spring—*i.e.* in the winter half of the year rather than in winter itself. Relief confines the area of sufficient rainfall to narrow strips along the coastlines of the Black and Mediterranean Seas. Inland it diminishes in amount, so that steppe and semi-desert conditions prevail, with rain coming in the winter, and snow on the high ground. Arabia lies in the desert belt, and is really part of the vast desert system that stretches across Northern Africa into Central Asia. The high edges of the plateau make the interior a very marked desert, and confine the slight monsoonal rains of the south to the narrow coastal strips and seaward slopes of the high land.

Development.—Although there is a considerable geographical unity in the area, it is not possible to consider it as a whole in so far as its political and economic development is concerned. Politically it contains, in the mountain area, all that remains of *Turkey*, the once dominating power of the whole region, and the ancient kingdom of *Persia*, now known as *Iran*. The plateau of the south is occupied by the Arab kingdoms of *Hejaz* and *Oman* and the British area of *Aden*. The connecting bridge area has the Arab kingdom of *Iraq* in the east, and the French and British mandated areas of *Syria* and of *Palestine* and *Trans-Jordania* respectively in the Mediterranean regions of the west. There is such a great diversity of race, occupation and production throughout the region, that it will be simpler to take each country separately.

Arabia

Build and climate.—Arabia is in many ways a continuation of the adjacent area of Africa, particularly in its life and peoples as well as in its build. The plateau area has a high rim along the west,

forming the mountains of *Hejaz* and *Yemen*, and along this line there have been considerable lava flows. These mountains are important as they lead to relief rainfall from the summer monsoon, thus filling the seasonal watercourses or *wadis*. Hence there are regions of cultivation at oases and large areas of poor grazing land. The interior is desert, except for the central oasis region of the *Shammar*, which lies between the *Nefud* desert of the north and the *Roba el Khali* desert of the south. In the south-east lie the mountains of *Oman*, an isolated group of young folds, which receive slight rainfall from the winter monsoons.

Development.—The *oases* produce mainly *dates*, which are used for food by the settled oasis peoples and the nomadic tribes of the interior. The *nomad* tribes rear *camels* which are traded for dates and manufactured goods. In *Yemen*, the most fertile region, there is still grown the famous *Mocha coffee*, the plant being protected from the strong rays of the sun by mists which rise up the slopes during the heat of the day. The *Bahrein Isles* and *Koweit* on the Persian Gulf are *pearl fishing* centres. The principal towns are the holy cities of the Mohamedan religion—*Mecca* and *Medina*, situated in *Hejaz*, and *Aden*. *Mecca* is reached from *Jeddah*, a port on the Red Sea, and *Medina* by a railway from *Damascus*. *Aden* is a coaling station port of call, but is chiefly important for its strategic position controlling the *Bab el Mandeb Straits* into the Red Sea. *Muscat* is the principal port of *Oman*.

Palestine and Trans-Jordania

Build and climate.—After the war this region became a British mandate and in recent years much interest has developed in the attempt to re-establish Palestine as the national home of the Jewish race. Along the coast of Palestine is a narrow fertile strip (the old Philistia), while behind it lie limestone highlands and then the deep rift valley of the *Jordan valley* and the *Dead Sea*. Trans-Jordania is a plateau region continuous with Arabia. The climate is Mediterranean on the coastlands but the interior is rather arid and extreme.

Development.—The coastal plain is the most fertile region, and is the main centre of the new *Jewish colonies*. It produces typical

Mediterranean fruits and cereals. *Olives* are most important round *Haifa* and *Acre* in the north, while *oranges* are the main crop of the *Jaffa* area in the south. The hill area is a pastoral region while the

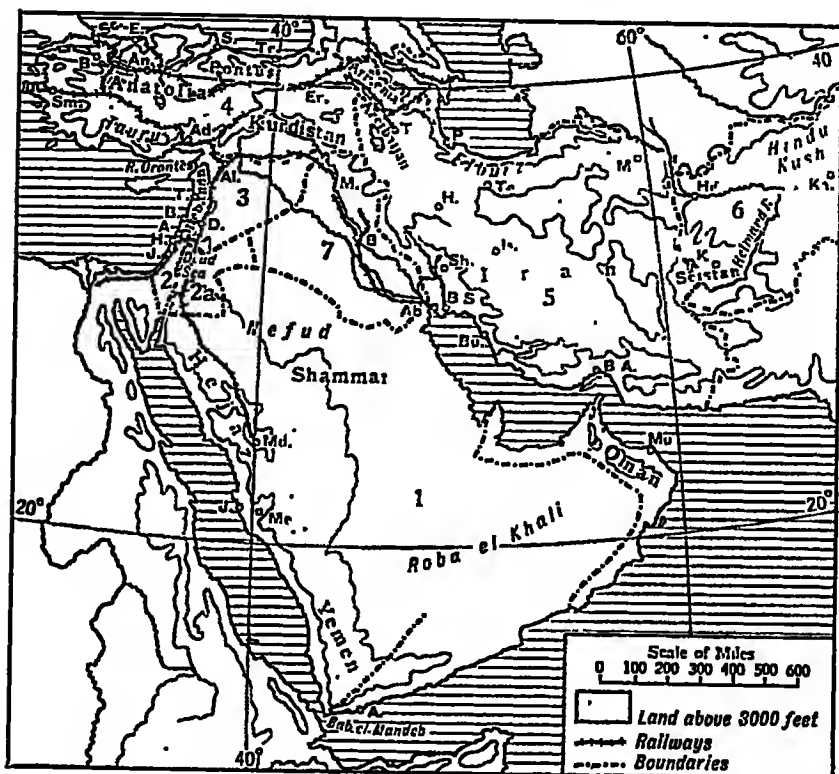


FIG. 115. SOUTH-WESTERN ASIA.

The countries are numbered according to the order in which they are taken in Chapter XXXVI.

Identify the towns.

chief importance of the rift valley lies in the possibility of extracting *mineral* salts from the Dead Sea, the most salty sea in the world, with a floor over 2,000 feet below normal "sea-level". *Trans-Jordania* is a pastoral steppe land, but is important for the routes

that cross it to Iraq and the Persian Gulf—motor route, air route and oil pipe-line.

The most important towns are *Jaffa* and *Haifa* on the coast. The latter has the better port and it has railways via Philistia to Egypt, to Jerusalem, and a link with the railway from Damascus to Medina, and it is now the British terminus of the oil pipe-line to Iraq.

Jerusalem presents a problem to the rulers of the area, as it is not only the holy city of Jews and Christians, but also of the Mohamedan Arabs who form the greatest proportion of the modern population of the country.

Syria

Build.—Syria is the French-controlled region occupying the western end of the fertile land-bridge. Along the coast is a narrow coastal plain, behind which are mountains, the *Amanus* in the north and the *Lebanon* in the south. East of the Lebanon is the valley of the *Orontes* which reaches the sea at Antioch, and beyond the Orontes lie the *Anti-Lebanon* and a plateau which sinks gradually to the *Euphrates* valley.

Development.—The coastal area produces *olives*, *oranges* and *lemons*, while *tobacco* is important round *Latakia*. The Orontes valley produces *grapes*, and *cereals* are grown on parts of the plateau. *Cotton* is of increasing importance in the north.

The chief ports are *Beirut* and *Tripoli*, the latter being the French terminus of the Iraq oil pipe. Both have railways into the interior. *Aleppo* is an important trading centre between the coast and the Euphrates, and will be more important if the railway to Baghdad is completed. *Damascus* is the most famous city of the area, as for centuries it was the centre of the caravan traffic going east or south, but its importance is diminishing under modern conditions.

Turkey

Build and climate.—The power that once dominated both European and Asiatic sides of the great land bridge between the

two continents is now confined almost entirely to the peninsula of Asia Minor, with a small strip in Europe.

Stretching westwards from the complicated highland area of the *Armenian knot*, the *Pontus* Mountains in the north and the *Taurus* Mountains in the south enclose the *plateau of Anatolia*. In the west of the peninsula the mountain ranges gradually sink and between them lie fertile deltaic valleys.

Turkey can be divided simply into *coastal* areas and *plateau regions*. The coastal areas are narrow along the *Black Sea* and south of the *Taurus* and are most important along the *Aegean*. They have a typically Mediterranean climate, the Aegean area being most pleasant as it has a good rainfall and is sheltered from cold winds. The plateau has a much lower rainfall and is liable to considerable extremes of temperature.

Development.—When considering the development of the country it should be remembered that the Turks are essentially a nomadic people and that the fertile coast-lands have been developed largely by Greeks, who have occupied them for centuries. In recent years the Turkish Government has repatriated these Greek colonists and, to a certain extent, this is having an effect on the productivity of the region, for what has been a gain from the point of view of Turkish racial unity has not been of economic gain to areas previously developed by an outside race.

The *coast-lands* are important, for Mediterranean products, especially *fruits*, *olives* and *olive oil*, come chiefly from round the *Sea of Marmora*, while *figs* and *grapes* (for *sultanas*) are the chief cash crops of the Aegean areas. *Tobacco* is important in the northern coast-lands, especially round *Samsun* and *Brusa*. *Cotton* from this region reached England in the Middle Ages, and it is still grown, mainly in the *Cilician* area to the south of the *Taurus*, with a lesser area round *Smyrna*. Another important crop of the Aegean area is *opium*.

The *plateau* is a pastoral area, *sheep* and *goats* being the main animals reared. *Mohair* from the Angora goat has always been famous, and Turkish *carpets* are also well known. There is a considerable mineral wealth which is not much exploited. *Coal* is

mined behind *Eregli*. The *chromite* production of the Brusa district has declined since the Great War. *Emery* is produced in the valley of the *Menderes*.

Towns.—The capital of modern Turkey is *Angora*, which is built on a volcanic plug in the north of the plateau region. It has a central position, but as yet roads and railways connecting it with the rest of the country are only in their infancy. It is being made into a capital by the drive of modern Turkish nationalism. *Smyrna*, with a good harbour, developed as the main town of the Aegean coastlands. It is still the main port of the most fertile part of the country and is comparatively well served by railways, being linked with the famous Berlin-Baghdad line that crosses the country from north to south. *Trebizond* is the main Black Sea port and *Scutari* is opposite Istanbul and so is an important route town. *Adana* is the chief centre of the Cilician area. *Erzerum* is the chief town of Kurdistan—the eastern portion of the plateau region.

The Iranian Plateau

Build and climate.—East of the Armenian knot the fold mountains open out to include a high plateau area which is occupied by the countries of *Iran* (or *Persia*), *Afghanistan* and *British Baluchistan*. The bordering mountains—which have many names throughout their lengths—are the only parts to receive much moisture, and the one region with a good rainfall is that along the Caspian slopes of the *Elburz* Mountains. The moisture mostly comes in winter in the form of snow, and it is water provided when this melts that is used to irrigate the cultivated portions of the plateau.

In the east, where the ranges are a considerable distance apart, there are regions of inland drainage—chief of which are the *Seistan* area of Afghanistan and the desert basins of Eastern Iran.

Development.—*Iran* is an agricultural country as the result of irrigation. *Wheat* and *maize* are grown as the chief food crops, while *cotton* and *opium* are the main cash crops.

The chief areas of development border the mountains. In the north-west the *Azerbaijan* district has a fairly good rainfall and there

is a fertile region round Lake *Urmia*. *Tabriz*, the terminus of a railway from Russia, is the main centre of this region.

The *Caspian* area, with its heavy rainfall and hot summers, is able to produce *rice*, which is exported to Russia from *Pahlevi*.

In the north-east another fertile region centres round *Meshed*.

The south-western mountains have not such fertile regions as those of the north. On the other hand, along their southern flanks, near the head of the Persian Gulf, are found the *oilfields* that constitute the main wealth of modern Persia. These have been developed by the Anglo-Persian Oil Company. The chief fields are found in the neighbourhood of *Shushtar*, and there is a pipe line to *Abadan* on the Shat-el-Arab.

Teheran, the modern capital, *Ispahan* and *Hamadan*, three important route towns, are situated at oases in Central Persia. Motor roads are helping to open up these central regions. The chief ports on the Persian Gulf are *Bandar Shapur*—with a railway to *Dizful* which has been extended to reach *Bandar-Shah* on the Caspian Sea via *Kum* and *Teheran*—*Bushire*, which serves *Ispahan*, and *Bandar Abbas*.

Afghanistan

Build and climate—This mountainous country has for long been important as a buffer state between Asiatic Russia on the one hand and British India on the other. It is an exceedingly mountainous area and parts of it are as yet little known, for it has always discouraged foreigners. Crossing it from east to west are the *Hindu Kush* and outlying ranges. To the north of the mountains rivers flow to inland drainage centres in Turkestan. To the south a small region drained by the *Kabul* river drains to the Indus, and the rest drains to the *Seistan* depression, the *Helmand* river here forming a fertile oasis area. The climate is marked by extreme temperature ranges, rainfall being small and coming in winter.

Development.—In the cultivated areas near the large rivers crops of *wheat*, *barley*, *rice*, *fruits* and *tobacco* are obtained, but most of the people are pastoralists, rearing particularly *sheep* and *goats*. The flocks are kept in the river valleys in winter but are moved up into

-the mountains during the hot dry summer. This movement from pasture to pasture is known as "transhumance".

Kabul, the capital, is in the centre of the most fertile area and is on the caravan route through the Khyber pass.

Kandahar is on the route from Quetta via the Khojuk pass, and *Herat* is on the main route from North-Eastern Persia.



FIG. 116. IRAQ.

Iraq

Build and climate.—In the centre of South-West Asia lies the depression between fold and plateau which is occupied by the combined valleys of the rivers *Tigris* and *Euphrates*. These rivers drain from the fold system and between them lies the big deltaic plain of *Mesopotamia*. This plain—which stretches from Hit on the Euphrates and Samarra on the Tigris to the Persian Gulf—was one of the cradles of civilization, for in it arose Akkad and Sumer, Nineveh and Babylon. Throughout history there was a constant story of settled dwellers in the plain being conquered by nomads from the surrounding hills and deserts, but always the conquerors

settled down themselves to a civilization based on the control of the flood waters of the plain.

The river floods from March to May, for this is a region of winter rainfall, and the floods, unless controlled, are destructive. The old irrigation system was destroyed by Mongol invaders in the 13th century and only in modern times has the process been recommenced. The present irrigation systems are chiefly on the Euphrates, based on the *Hindiya* barrage and the use of *Lake Habbania* to conserve the surplus flood waters of the river.

Development.—Above the limits of the delta, in the region lying round *Mosul*, the country is a steppe land, largely devoted to grazing. In the delta there is a good deal of marshy unhealthy land, but in regions where irrigation is carried on there is settled agriculture, handicapped by the lack of suitable labour. The chief cereal crop is *rice*, which is grown in the summer, the winter cereals being *wheat*, *barley* and *millet*. The most important crop of the country is *dates*. These are grown all along the rivers and particularly in three areas. The most important area is along both banks of the *Shat-el-Arab* distributary below *Basra*, the other regions being round *Baghdad* and in the *Hindiya* barrage region. A cash crop of more recent development is *cotton*, which is being grown round *Baghdad*.

Petroleum is found along the edge of the fold system at *Kirkuk* and *Khanikin*, to the north of *Baghdad*. This area will develop rapidly now that there is a pipe line to the Mediterranean which overcomes the transport difficulty.

After the Great War this country became the Arab kingdom of Iraq, at first under British mandate, but now independent. The development of oil mining and irrigation are restoring to it some of its old time prosperity.

The chief towns are *Baghdad*, the capital, situated at a route point where the two river valleys lie close together, and *Basra*, the main port, which is situated at the head of the *Shat-el-Arab*. There is a railway from *Basra* to *Baghdad* along the Euphrates valley while the Tigris is navigable to *Kut-el-Amara*, above which there is a railway to the capital: *Mosul* is the centre of the steppe country and is on the northern route to *Aleppo*.

valleys which are drained by rivers that flow into the inland drainage area of the *Aral Sea*. It is these western valleys, and the basin of the Aral Sea, that form Russian Central Asia or *Turkestan*.

The southern boundary is formed by the *Hindu Kush*, from which the *Murghab* flows into the Oasis of *Merv*. Between the Hindu Kush

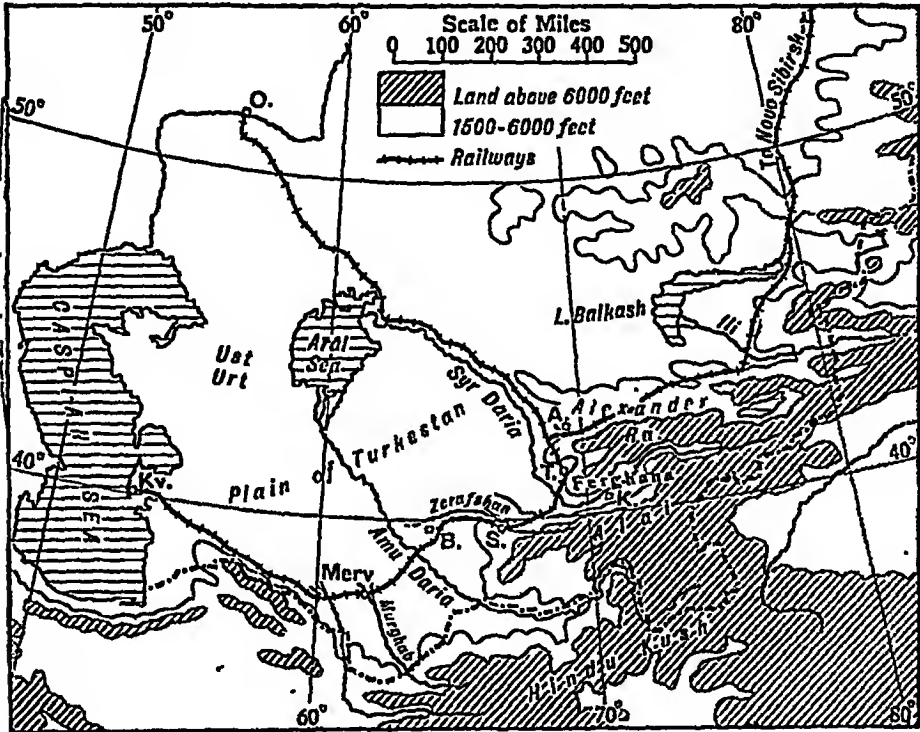


FIG. 118. RUSSIAN CENTRAL ASIA.

and the Alai range flows the *Amu Daria*, with its important right bank tributary the *Zerafshan* draining the east of the Alai. Between the Alai and the *Alexander* range the *Syr Daria* drains the *Ferghana* district. North of the *Alexander* range the *Ili* river drains to *Lake Balkash*.

Between the mountains and the Aral Sea lies the desert *Plain of Turkestan*, and between the Aral and Caspian Seas lies the low plateau of *Ust Urt*.

Climate and vegetation.—The climate is everywhere extreme, and rainfall is low and comes mostly in spring. The rivers are fed by the melting snows and, by making irrigation possible, lead to the development of the area.

The Plain of Turkestan is almost entirely desert, but the slopes of the mountain have steppe pastures which higher up give place to forests of temperate trees. In the north is the Kirghiz steppe land, which marks the transition from the desert to the grassland of Siberia.

Development.—The regions of irrigation have been the centres of civilization for countless centuries, *wheat, rice, fruit and vegetables* being grown. In modern times the chief importance of the region lies in the production of *cotton* to supply the factories of Russia. The old towns of the region grew up and were famous—almost fabled—as caravan centres, and *Tashkent, Khokand, Samarkand* and *Bokhara*, as the centres of the most fertile districts, are still the main towns. The old caravan routes are now unimportant compared with the railways that open up the region. The *Trans-Caspian* runs from *Krasnovodsk* on the east of the Caspian, via Merv, Bokhara and Samarkand to Tashkent, where it meets another line from *Samara* and *Orenburg* in South-East Russia. From *Arys*, on this line, the *Turk.-Sib.* railway goes to *Novo Sibirsk* on the Trans-Siberian.

Siberia

Build.—Frequently described as the “Russian Canada” this vast area occupies a considerable portion of the total land surface of the globe, but it is impossible here to indicate more than the brief outlines of its geography. Stretching from the *Urals* (the present political area even extends west of the Urals) to the *Pacific*, and from *Altai* and *Sayan* mountains to the *Arctic* Ocean, the country contains three broad physical units. In the west the *Ob* and its tributaries *Tobol* and the *Irtish* drain a lowland of comparatively recent structure. The *Yenesei* drains a region of old hard rocks, worn down to a peneplain, while in the east the *Lena* and the *Amur* drain a region of old mountain systems that continue the mountains of Central Asia.

Attention is directed to these rivers, all of which are large enough to rank among the world's great rivers, particularly the Ob. With the exception of the Amur they drain northwards to the Arctic, and this fact dominates all others in their relationship to the development of the regions. Because of it their navigability is lowered, for their mouths are ice-bound for more than half the year, they are liable to flood owing to their upper streams thawing before their mouths, and the north-south direction of flow is opposite to the main direction in which transport is wanted in this region.

Nevertheless, they are of considerable use for local transport, and there is a growing export trade along them and then out through the Arctic Ocean.

Climate and vegetation.—Climate is generally regarded as one of the greatest hindrances to the development of Siberia. Owing to its position in the largest land-mass it experiences the greatest extremes in the world, and in north-east Siberia lies Verkhoyansk the "Cold Pole" of the world. The whole region is well below 32° F. during the winter months. As a result, there is only a short growing period and farming has to be adapted to this. As in Canada, science is endeavouring to overcome this by developing new types of grain which will ripen quickly.

As it is an inland region, rainfall is light, and comes mainly in the summer, though cyclonic disturbances bring some snow in winter. Owing to the cool summer, however, and the fact that the rain comes in summer, this rain, with the moisture from the melting snow, is quite sufficient for good plant growth over much of the area. Only in the south-west, on the borders of Turkestan, is the effective rainfall so low as to lead to semi-desert condition.

The vegetation has already been described in Chapter XXVIII, viz. the *Tundra* in the north, the *Taiga* forest stretching south to the mountains, and the grasslands and *steppes* in the south-west.

Development.—Siberia for long suffered owing to its evil reputation as a penal settlement, but the opening up of the country by encouraging settlers and the building of the railway led to a gradual change. The most important area lies in the west, partly because of proximity to Russia, but also largely owing to its large stretches

of fertile plains. The tundra lands are naturally little developed, while the Taiga is not so important a source of either *fur* or *timber* as its size would suggest. It is the home of nomadic fishing and hunting peoples, of whom a few have begun to acquire the beginnings of civilization. Chief of these peoples are the *Samoyeds* and *Ostiaks* of the west and the *Yakuts* of the east. In the *Irish* valley in the

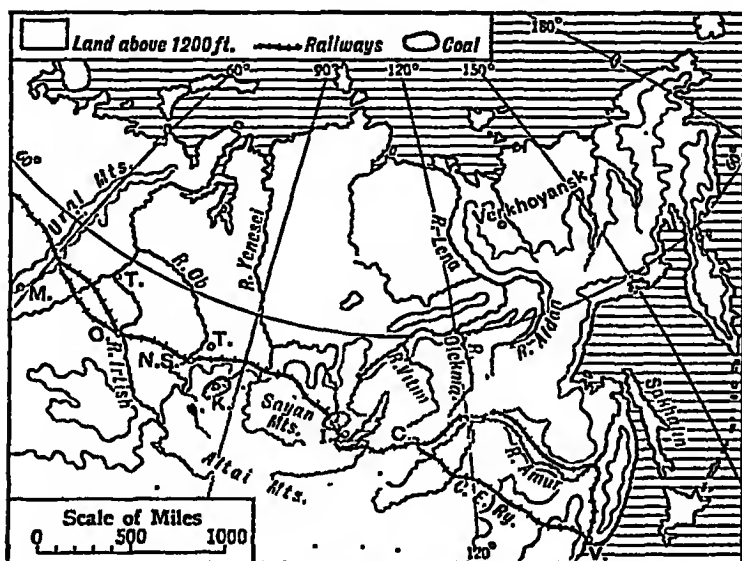


FIG. 119. SIBERIA AND THE TRANS-SIBERIAN RAILWAY.
Identify the towns.

west the Taiga gives place to a fertile "black soil" region of wooded steppe and this is the chief region of settlement. *Cattle rearing* led to a big export of *butter* in pre-war days and this industry is being slowly revived. There is also a revival of the *wheat* growing for which this region is particularly suitable. Siberia is more likely to become important for its minerals. The *gold* mines of the Lena area produce most of Russia's gold, mining taking place in the river valleys along the edge of the southern mountains especially in the valleys of the *Vitim*, *Aldan* and *Olekma*.

The chief mineral is *coal*, which is known to exist in large quantities in the mountains between the Ob and Lake Baikal, and in the lower Yenesei valley. The main mining centre is at *Kusnetzk*, in the *Tom* valley. It is also mined near *Irkutsk* and there are fields in the east near *Vladivostok*. The coal is used locally for the railway, but although *iron* is known to exist in the Yenesei region, the coal is at present taken by rail westwards to the mineral area of the Southern Urals, where it is used for the iron and steel works of *Magnitogorsk*. *Copper*, *lead* and *zinc* are also mined in the mountain region but not, as yet, in important quantities. *Oil* is found in the north of *Sakhalin* Island.

Railway and towns.—The *Trans-Siberian* railway was built very largely for political reasons, being designed to open up a way to the Pacific and the Far East. It has brought economic developments, for settlement is mainly confined to regions within easy reach of it. Practically all the important towns are upon it. After leaving *Chelyabinsk*, at which point lines from Moscow and Leningrad converge, the railway crosses the fertile steppe lands of the Irtysh valley and where it crosses that river stands *Omsk*, the chief town of Western Siberia and centre of the butter industry. Further north *Tobolsk*, situated at the confluence of the Tobol and the Irtysh, is an important agricultural centre which suffers from being off the railway. Further east the railway crosses the valley of the Tom, but *Tomsk*, the chief town of the mining area, is slightly to the north on a branch line. *Irkutsk* stands on the western shores of Lake Baikal, and is an important trading centre for Mongolia. *Lake Baikal*, with a depth of over 5,000 ft., is the deepest lake in the world and is large enough to have a modifying influence on the climate of the surrounding region.

The railway now goes round the south of the lake, the old ferry across having been superseded. The Russian section of the railway goes along the north bank of the Amur, but the most direct route is across Manchuria by Chinese Eastern Railway from *Chita*, the frontier town. *Vladivostok*, the objective of the railway, is an important port, serving Siberia and Manchuria. It has to be kept free of ice in winter. Local coal and oil are important in helping it to develop.

EXERCISES ON CHAPTER XXXVII

1. Describe the main occupations in Siberia and show how they are related to geographical conditions. (C.S.C.)
2. Describe the shortest overland route by which a merchant would travel from Manchuria to Moscow. State the main towns he would pass through and the chief types of natural vegetation he would see at various stages of his journey. (C.S.C.)
3. Why did the area known as Turkestan decline in importance? What facts have led to its recent recovery of some of its old importance?

ASIA: GENERAL REVISION QUESTIONS

1. Latitude is not an all-important control of geographical distributions. Illustrate this statement by comparing and contrasting the Ganges valley and the Arabian Peninsula. (L.G.S.)
2. What geographical conditions make human life difficult to support in (a) the Arctic coastlands of Asia, (b) Tibet, (c) Arabia? How are the inhabitants of each area able to adapt themselves to the conditions you mention? (O.S.C.)
3. India, China, and Japan are lands of a monsoon climate. What do you mean by this statement, and into what major natural regions would you subdivide this vast area? (O.S.C.)
4. Select *one* area in Southern Asia which is very densely peopled and *one* which is very sparsely peopled, and show in each case how far physical features and climate control population. (O.S.C.)
5. Where in Asia are the following used as an important method of transport of goods or passengers: reindeer, yak, camel, and human porter? Show how each method is particularly adapted to the geographical conditions of the region which it serves. (C.S.C.)
6. Name and give the locations of four great alluvial plains of Asia of which at least two are densely peopled. Select one of these four plains and (i) state its climatic conditions, (ii) name four crops grown, (iii) describe briefly the methods of agriculture used on this plain. (J.M.B.S.C.)

CHAPTER XXXVIII

EUROPE: AND THE RUSSIAN LINK WITH ASIA

Build.—In Chapter XXVIII the broad outlines of Europe's build and climate were described. These should be revised and particular attention paid to the following main outlines.

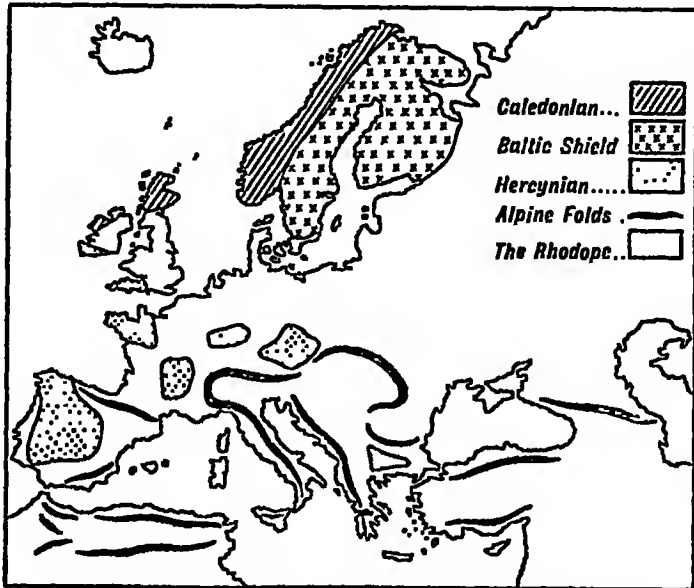


FIG. 120. THE STRUCTURAL AREAS OF EUROPE.

The continent, which has a marked peninsularity and a long coastline as compared with its area, has four main physical regions, viz. from north to south the old *Caledonian system* and *Baltic shield*, the *European plain*, the remnants of the *Hercynian system*, and the folds of the *Alpine system*. These are shown on Fig. 120, and they should be learned carefully. It will be necessary to consider them more carefully in the regional work. One important point should be noticed

at this stage—the Hercynian system belongs to the *Carboniferous period* and so is associated with the main European coalfields.

Climate.—As a means of revising details of the climate of Europe the main facts and factors can be summarized as follows.

Temperature range increases to the east and a general idea of temperature regions is gained from Fig. 121, which uses certain

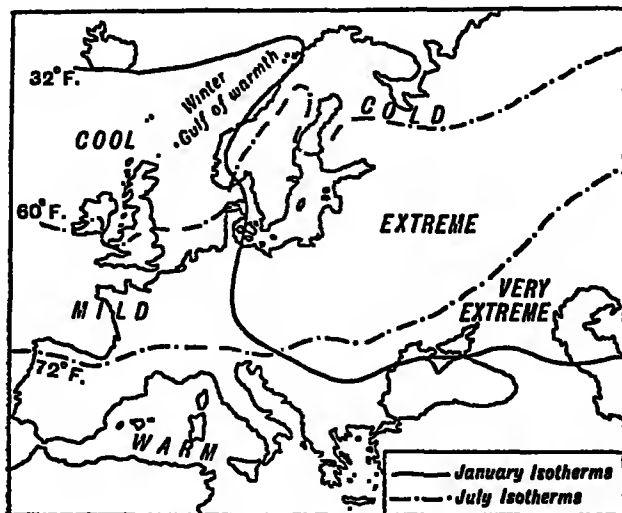


FIG. 121. TEMPERATURE DIVISIONS OF EUROPE—BASED ON ISOTHERMS.

The terms are used in a comparative sense in order to bring out the differences between the various parts of the continent.

January and July isotherms for dividing it up into broad regions. The influence of the "winter Gulf of Warmth" on the north-western coasts is important.

Winds and rain are easily understood when it is remembered that there are three main pressure influences at work. Off the *Azores* is a *high pressure* region—the horse latitude high pressure—which is most marked in summer, when the land is heated and air is displaced from over it. Near *Iceland* is a centre of *low pressure*, which is most marked in winter, when the sea is warm compared with the land.

The *continent* is a region of *high pressure in winter* and winds and cyclonic disturbances are limited in their influence. In *summer pressure is low* and winds are able to penetrate right across the continent, for there is no mountain barrier to stop them.

These factors lead to three rainfall regions. In the south is the winter rain region of the Mediterranean. In the north-west is the region of regular rain, and in the interior is the region with a summer maximum, the transition between the last two being gradual.

Vegetation and people are dealt with in Chapter XXVIII.

Russia

Considered from the point of view of build, climate, race or politics it is only too evident that Russia is an important link between Asia and Europe. In many aspects of its geography it is as much Asiatic as European, and the fact that it has been regarded as European for some centuries is partially due to the deliberate effort of Peter the Great, who set out to bring the country into line with its western neighbours.

Build.—Russia in Europe has a most simple physical make up, for it consists of almost undisturbed old sedimentary rocks lying on the old hard rocks of the *Russian platform*, and forming a vast plain stretching from the Arctic in the north to the Black Sea and the Caucasus in the south.

The only place where the plain rises to any extent is in the *Valdai* hill region, and from this upland—only a thousand feet above sea level—the great rivers of the plain flow outwards. In the south the old rocks of the platform come to the surface and form small hill ranges.

Climate and vegetation.—In such a vast uniformity of build differences of climate and vegetation become very important, and in Russia they determine the natural regions of the country. In winter the whole country is cold, temperatures being everywhere below freezing point save in the extreme south. In summer, however, while the north is too cool and has too short a growing season for trees or crops, the south is so hot that the rainfall, being below 20

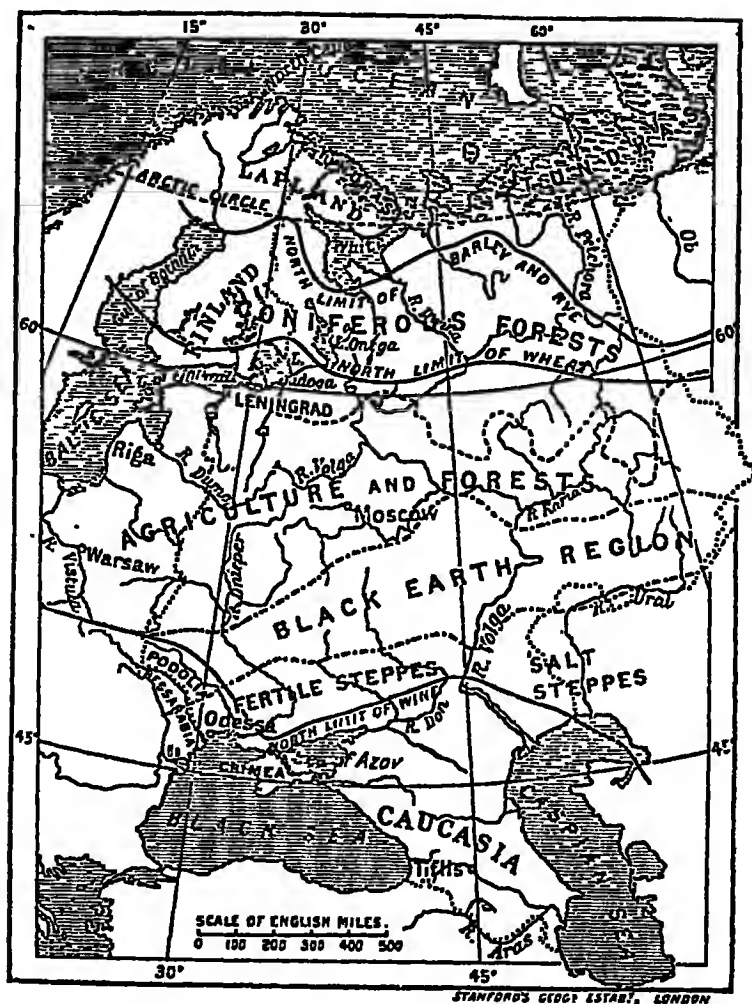


FIG. 122. VEGETATION ZONES OF RUSSIA.

Note limits of various crops.

inches, is only sufficient for rather poor pasture. The vegetation zones of Russia are shown in Fig. 122. They conform to the normal controls of climate. The shape of the deciduous forest belt is

Y

R.W.G.

interesting as showing the limits of the modifying temperature influences of the Baltic Sea. The southern edge of the deciduous belt is a transition region of "forest-steppe", which is of considerable agricultural importance. The Black Soil area marked is the most fertile region of the country. The soil is partly glacial and partly loess, but the fertility and black colourations are the result of the humus formed from the remains of steppe grasses.

Farming.—The primary occupation of Russia has always been farming. Until the beginning of the present century the cultivation was carried on by peasants who were centuries behind the farmers of Western Europe. The Russian revolution of 1917 hastened the changes that had begun to take place; and in recent times the Soviet Government has changed completely the entire aspect of Russian farming by bringing practically all the agricultural lands into big "collective" farms and by introducing machine methods based on American ideas. Before the Great War Russia was a big exporter of grain, and now it is just beginning to become important in world grain markets again.

Wheat is the main exported cereal and this is grown principally in the *Black Earth Region* and in the area of the forest-steppe. It is exported from *Odessa* on the Black Sea.

In the northern areas, where there is a shorter growing period, *rye* and *barley* are grown, rye being the main food crop of the northern regions. *Potatoes* are also important in these northern areas.

Cash crops are becoming more important with the development of Russian industry under the "five year plan". *Hemp* and *flax* are grown in the cooler northern districts, and *cotton* is being developed in the Caucasus area of European Russia in order to supplement the supplies from Turkestan and make the country self supporting in that commodity.

The collective farms pay special attention to the cultivation of "industrial" crops. Chief of these is *sugar beet*, which is grown largely in the region round *Kiev*. Other such crops are *soya beans* and *sunflowers*, both of which are used to provide oil for various purposes as well as cattle food.

Pastoral occupations are important in the drier steppe lands to

the south-east. In the valley of the Don is the home of the famous "Cossacks", a nomadic pastoral people. Near the Caspian, where the steppe is poor, *sheep, goats and camels* are the main live stock. *Horses and cattle* are reared in the better grassland areas.

Mining and industry.—The industrialization of Russia has already been referred to. It is only since 1900 that the full resources of the country's mineral wealth have been realized. Industry is made possible by considerable supplies of coal and oil and hydro-electric power.

The *coalfields* of European Russia are found at *Tula* to the south of Moscow, and in the *Donetz* basin. The latter, developed in the present century, now produces the greater part of the country's output, and is leading to a considerable industrialization in the area.

Oil is found along the shores of the Caspian, this region being one of the big oil producing centres of the world.

The main centres are *Groznyi* to the north of the Caucasus and *Baku*, which being south of the mountains is really in Asia. From both of these pipe lines take the oil to ports on the Black Sea, *Tuapse* and *Batum* respectively. Oil from the *Emba valley* field to the north-west of the Caspian is taken by pipe line to *Samara*, on the Volga. The main *hydro-electric* development is at *Dnepropretrovsk*, where the rapids of the Dnieper are utilized by means of a great dam.

Iron is found in the south of the Urals, where *Magnitogorsk* is being developed to use the coal from Kusnetsk in Siberia, and at *Krivoi Rog*, in the valley of the Dnieper. The Ural area is very rich in minerals, *copper* and *platinum* being mined near *Perm*.

The Tula coalfield led to the development of industries in the Moscow area—where there was a good market. *Tula* itself makes iron and steel goods; *Moscow, Yaroslavl* and *Ivano-Voznesensk* making textiles from local flax and imported cotton. *Gorky* is the centre of a big modern motor industry.

Kiev and *Kharkov* had milling and sugar industries, but the main industrial area of the south is growing up near the coal and iron area. Iron and steel works are situated at *Stalin*, and agricultural machinery is made at *Dnepropretrovsk* and *Rostov*, while *Stalingrad*, with its big tractor factory, looms large in the development of the new Russia.

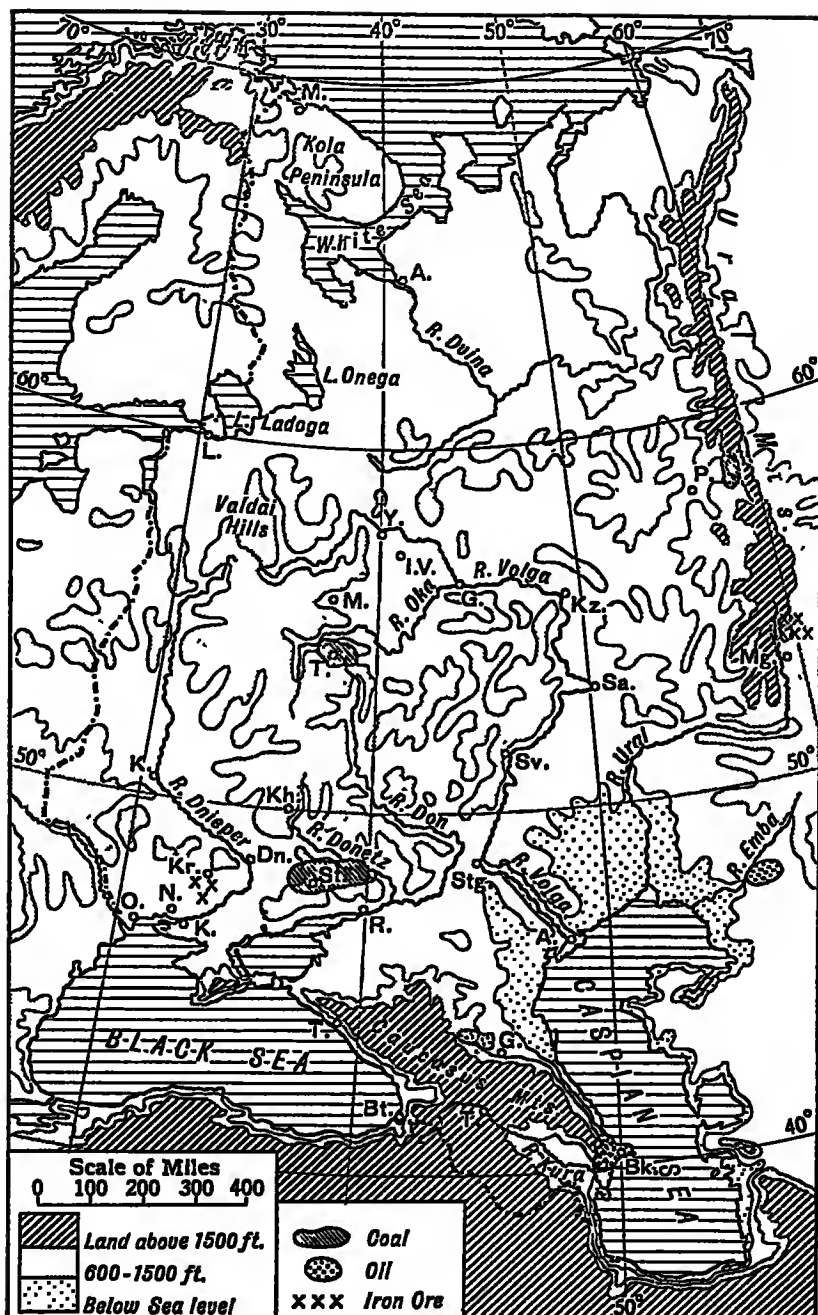


FIG. 123. RUSSIA.

Identify the towns.

Note—(i) absence of high ground ;
(ii) the few towns of the north.

Natural Regions and Towns

The tundra area is of little importance. It is inhabited by wandering tribes of *Lapps* and *Samoyed*, whose condition of life is, however, better than that of the Eskimos of the Barren grounds of North America because of the *reindeer* which provides them with food and drink, clothes and shelter, and means of transport. The north shore of the *Kola Peninsula* is, despite its latitude, ice-free throughout the winter because of the influence of the winter Gulf of Warmth, and consequently the port of *Murmansk* has been built here, with a railway to Leningrad. It is not of great importance.

The coniferous forest belt is a region of hard conditions in which a certain amount of settled agriculture is possible, but it is mainly important as a source of *timber*. Large quantities are cut and exported from *Archangel*, the port on the White Sea, to which timber is transported by river.

The port is connected by rail to the main regions of the country, but is handicapped by being frozen for more than half the year. In the west of the region, near *Lakes Ladoga* and *Onega*, better soil and the possibilities of hydro-electric power are leading to a certain amount of development.

The deciduous forest, with the *forest-steppe* in the south, has been the main centre of Russia throughout history. Much of the land has been cleared for agriculture and it contains the greater part of the population and the chief towns.

Moscow, the present and the old capital, is centrally situated in this region and in the whole country. Its industries have been mentioned, while its position has led to it becoming the focus of the somewhat inadequate railway system.

Leningrad, which Peter the Great built as his capital to give Russia a "window on to Europe", is the main Baltic port of the country, but it is hindered by the freezing of the Gulf of Finland. It has declined in importance and in population since the present Government transferred the seat of government to Moscow.

Kiev, the chief centre of the forest-steppe area, is a very important old town. It is an old religious centre owing to its ease of access

from Constantinople, the centre of the Orthodox Church, to which old Russia belonged. The towns of the Tula industrial area have already been mentioned.

The steppe lands and the semi-deserts.—Although the grain growing areas are of considerable importance they have few large towns. The chief being *Kharkov*, capital of the Ukraine. The main towns in the south are growing up in connection with the Donetz industrial area. The Black Sea coast is sandy and has few good harbours, the chief being *Odessa*, which stands at the head of a bay. *Nikolayev* and *Kherson* are smaller ports, the latter being at the mouth of the *Dnieper*. The shallow Sea of Azov prevents the development of *Rostov* at the mouth of the *Don*.

It is unfortunate for Russia that the chief river and main waterway of the country, the *Volga*, flows into the land-locked Caspian. There is a considerable traffic on the river, and on its banks have grown up a few important trading centres, chief of which are *Kazan* and *Saratov*. *Astrakhan* is the main port of the Caspian, and is the centre of the *sturgeon* fishing for which the sea is noted.

The southern mountains.—The south of the *Crimean peninsula* is really part of the Alpine system, and along its southern shores is a region with a Mediterranean climate, sheltered from the north. This is a centre of holiday and health resorts.

The *Caucasus* area really includes a part of Asia, but it is all included in the political area of Russia and may be dealt with here.

North of the mountains is a region similar to the adjoining steppe lands, and this is being developed by means of large collective farms.

The mountains show the east-to-west formations of the Alpine system. They are high and difficult to cross. South of them lie the valleys of *Georgia* and part of the tangled Armenian knot, the home of peoples who have long struggled to maintain their independence from Turkey and Russia, and who now form republics within the Soviet Union. The valleys are fertile and grow wheat, maize, grapes and tobacco. The mineral wealth, particularly the oil, has been mentioned. The chief town is *Tiflis*, in the valley of the *Kura*, the main river of the region, with rail connections to both sea-coasts and important also because of the railway into Iran.

EXERCISES ON CHAPTER XXXVIII

1. Russia normally exports timber, wheat and petroleum. Where are the chief centres of production of each export? Describe the routes by which the commodities are exported. (C.S.C.)
2. "Russia is handicapped by the lack of a good port." Write an account of the Russian ports and in it discuss this statement.
3. Where are the main centres of industrialization in Russia? What geographical factors have led to the localizations you mention?
4. Show how Russia illustrates the control of vegetation by climate.

CHAPTER XXXIX

THE ICE AGES AND EUROPE: NORTHERN EUROPE

In Chapter XIX the effects of glaciation have already been explained. During the period of the *glacial epochs* Europe was considerably affected by the ice sheets.

The main ice sheets spread southwards from the northern highlands, while lesser ice sheets spread outwards from the Alpine region, and at the same time played a great part in developing many of the features of the Alps themselves.

Before considering the regional geography of the north of Europe it will be convenient to summarize the chief effects of the glaciation.

The ice sheets—for there were four glacial periods—scraped much of the surface from the Scandinavian area, leaving exposed considerable areas of the old Baltic shield, thus giving rise to *infertile regions*. In Finland the countless *lakes* that dot the surface lie in hollows scooped out by the ice.

This eroded material was carried southward and deposited on the lands that now form the southern shores of the Baltic. The deposits are not uniform. Physically the most notable are the lines of hills, formed by the old *moraines*, that are known as the *Baltic Heights* of

Germany and Poland and the *Eskers* of the Baltic states. Most important is the fertile *boulder clay*—which is unfortunately in many places covered over by less fertile sands and morainic material that form the *heathlands* found in the region.

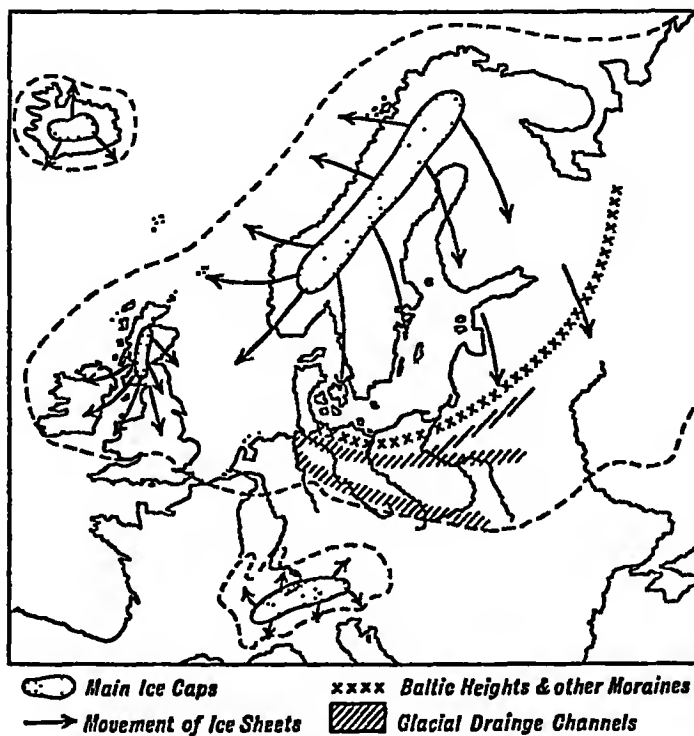


FIG. 124. THE GLACIATION OF EUROPE.

The water that flowed from the melting ice could not escape southwards owing to the mountains, but had to flow westwards, as did also the water from the melting ice of the Alpine ice sheets. These vast ice-fed streams formed broad east to west *valleys* in central Germany and Poland. The main drainage is now from south to north, but most of the rivers crossing the plain bend westward in this valley region, and many tributaries flow east to west, so that it has been easy to link up the rivers of the northern plain by canals and form a vast system of inland waterways. The old glacial valleys

were often marshy, but modern drainage has made them regions of great fertility.

Northern Europe

Occupying the Scandinavian peninsula and lying on both sides of the Baltic Sea is a group of comparatively small countries—small that is in terms of population. Some of these, Norway, Sweden and Denmark, have their roots deep in history, while those on the east of the Baltic have only been independent since the break up of the Russian Empire in 1917, though the races that have now established their autonomy have managed to retain their racial inheritance through centuries of Swedish and then Russian rule.

Build.—The Scandinavian peninsula and Finland to the east of the Baltic are of old formation. Most of Sweden and Finland consists of the old rock peneplain that is known as the *Baltic shield*, while the higher ground of Norway and Western Sweden is the worn down remains of the old folds that, with the Highlands of Scotland, are known as the *Caledonian system*.

Denmark is physically part of the *North European* plain, and the small countries of Esthonia, Latvia and Lithuania are part of the *Russian lowland*. They have all been much influenced by *glaciation*; the old rock areas showing evidence of it in erosion, the lowlands in the vast deposits of glacial material that form so much of their surface, while the lakes of Sweden are due to the sinking of a portion of the area during the glacial period.

The most striking thing in the region is the indentation of the Norwegian coast. The numerous *fjords* or inlets, many of which stretch for miles inland, are the result partly of rifting, but largely of glaciation deepening existing valleys, which later sank and became "drowned". Off the coast is a line of islands known as *skerries*, and between these and the mainland is a sheltered waterway known as the *Inner lead*.

Climate.—Relief is important in climate. West of the main watershed the influence of the Atlantic gives Norway a mild wet climate, but the region round the Baltic experiences severe winters and a much lower rainfall. Much of the precipitation on the High-

lands is in the form of snow and the region has therefore many snow-fields and glaciers.

Norway

Occupations and productions.—The life of the Norwegian people is very much dominated by their environment. The small amount of land and the sheltered waters of the fjords have led to the development of a big sea tradition which has been famous throughout history. In modern times *fishing* is of great importance. Cod fishing is carried on in the area of the *Lofoten Islands*, while in the south *Bergen* and *Stavanger* are concerned with the fishing of the North Sea. This association with the sea also causes the Norwegians to be a race of maritime "carriers", carrying goods for other nations. The climate has led to the lower slopes of the mountains being clothed with coniferous forest, and these forests provide the main export. Hydro-electric power is of great service in preparing the *timber* and *wood pulp* for export.

Farming is only possible on a small scale. There is usually a small deltaic area of fertile land at the head of each fjord, and on this *root crops*, *grain* and *hay* are grown. *Cattle rearing* is made possible by the use of the summer pastures above the forests and on the edge of high plateau areas, which are known as *fjelds*. The only large area of lowland where farming can be carried on to any extent is round *Christiana Fjord* and in the *Glommen* valley. Co-operative creameries are helping to make dairy farming more important.

The development of *hydro-electric* power has made it possible to utilize the considerable quantities of *iron* and *copper* which are mined in the *Roros* district. Of great importance are the various *fertilizers* manufactured by the fixation of nitrogen, while *calcium carbide* is also manufactured in large quantities.

Towns.—The main towns are coastal. *Oslo*, the capital, is at the head of *Christiana Fjord* and is the centre of the main lowland. It has rail communication eastwards to Sweden, westwards to *Bergen* and northwards, via the *Glommen* valley, to *Trondhjem*, an important timber and fishing centre.

Sweden

Farming.—Much more level than Norway, Sweden has a greater population and more diverse occupations.

Agriculture is possible over a larger part of the country. The chief agricultural areas are in the lowlands in the depression that contains the great lakes *Wener*, *Wetter*, *Hjalmnar* and *Malar*, and in the small province of *Scania* in the extreme south. Between these two areas is a region of infertile hard rocks.

The climate only permits of the growth of the *hardy cereals*, *root crops* and *hay*, and so the main development is *dairying*, and there is an export of *butter*. North of the *Dal* River there is little farming as the land is infertile and the climate poor. What farming there is takes place along the coastal margins and round the glacially-formed lakes that are found in the upper courses of the rivers at the foot of the high ground.

Forestry.—Nevertheless, it is from this seemingly poor area that the main sources of Swedish prosperity are derived. The Baltic shield is a region of coniferous forest, and a great deal of *timber* is exported. The lumbering takes place in winter, the wood is exported when rivers and coasts are ice free. The falls of the rivers provide hydro-electric power, which is used in preparing timber for export, Sweden exporting *sawn timber*, *doors*, *window frames* and *wood pulp*, rather than mere logs.

Connected with the timber industry is the great *match* industry, which is carried on at *Jonkoping* in Central Sweden.

Mining and manufacture.—The old rocks contain rich iron ore deposits. There are two main iron regions. In the north, in Lapland, are the rich mines of *Gellivara*. During the long cold winters work has to be carried on by artificial light, for it is within the Arctic circle, and as *Lulea*, on the Gulf of Bothnia, is frozen for half the year much of the ore is exported from *Narvik*, an ice-free port in Norway. In the south iron is mined at *Grangesberg* and *Dannemora*. Here smelting has developed with imported coal and, in modern times, electricity. The great development of hydro-electric power has made Sweden an important country for the manufacture of *electrical machinery*.

Apart from the industries already mentioned there is some *textile* manufacture, but Sweden relies on foreign trade for most of these requirements.

Towns.—The capital is *Stockholm*, which is situated at the entrance to *Lake Malar* from the Baltic. Built on either side of the river and on several islands, it is often called the "Venice of the Baltic". It is situated at the meeting place of the main route north-south along the coast and the main east-west route via the region of the Great Lakes. The lakes are utilized by the *Gota Canal*, which runs from *Soderkoping* on the Baltic to *Goteborg*, which, owing to its position on the North Sea, near the main European shipping routes, is now the main port of the country. It is supplied with electric power from the *Trollhata* falls, on the Gota River, and some of this power is "exported" to Denmark. In the south *Malmo* is the chief port of Scania and is important for train ferry routes to Denmark and Germany.

Denmark

Build.—The northern part of the peninsula of Jutland, and the islands of *Fyen*, *Laaland* and *Zealand*, lying between it and South Sweden, form the country of Denmark. Physically it is part of the North European plain but racially, socially and politically it is linked with Scandinavia and has little in common with the main regions of the plain.

It is a low-lying area, the main heights—of some 600 ft.—being morainic in origin. The west of the peninsula is sandy and infertile but the east and, more particularly, the islands contain much fertile glacial soil.

Farming.—The rather damp climate is not very suitable to the growing of grain crops, and Denmark—small, compact and hence comparatively uniform—has deliberately concentrated on the production of *butter*, *eggs* and *bacon*. To do this, co-operative creameries and factories have been organized, a standardized marketing system and quality developed, and a suitable technical education established. Much cattle food in the form of grain and oil-cake is imported, so intensive has this method of farming become. The

dairy produce is exported to the surrounding manufacturing countries, mostly to Great Britain.

Towns.—*Copenhagen*, the capital, commands the route into the Baltic via the Sound and the main land route from the continent to Sweden. Its position has become less important since Germany constructed the Kiel Canal, which obviates the passage into the Baltic via *Skager Rak*, *Kattegat* and *Sound*. *Esbjerg*, on the comparatively barren west coast, is a fishing centre for the North Sea, but owes most of its importance to the trade with Great Britain.

The Baltic States

Lying between Russia and the Baltic Sea is a group of small States, *Finland*, *Latvia*, *Esthonia* and *Lithuania*, which, until the revolution of 1917, formed part of the Russian Empire. These States are small and owe their existence to the desire of small racial elements for autonomy.

Finland.—This lies north of the Gulf of Finland and is larger and more distinctive than the other three States. It consists chiefly of the eastern portion of the Baltic shield, and its surface is a lake-studded old rock area, with much morainic material. The land is not particularly fertile, save near the coast and in certain old lake bed areas. The northern area extends into the Arctic circle so that agricultural development is further limited. The climate is naturally not good, the main drawback to agriculture being the shortness of the growing season. The greater part of the country is covered with forests, which are part of the great coniferous forests of Northern Europe. The forests supply the chief source of wealth and there is a large export of *timber* and *wood pulp*. Cutting is carried on in winter, the logs being transported by rivers during the floods associated with the spring thaw. The many rivers, thanks to the nature of the country, provide hydro-electric power, which is of great value to the timber industry.

Farming is essentially connected with fodder crops, for grain crops are more cheaply imported than grown. *Dairy farming* is thus being developed and *butter* is exported. The main towns are on the coast. *Helsinki* (Helsingfors), the capital and principal port, stands

on the north shores of the Gulf of Finland, and in a commanding position at its mouth. Apart from its timber industries, there are some *textile* manufactures.

Viborg stands at the head of the Gulf, while *Turku* (Abo) is on the Baltic coast. The only important inland town is *Tammerfors*, on the railway from Helsinki northwards past the west of the main lake area.

Esthonia, Latvia, and Lithuania.—These three small countries stretch in that order southwards from the Gulf of Finland to the borders of Germany and Poland. They are all low-lying areas and physically are a continuation of the Russian plain. Much of the surface shows signs of glaciation, and the fertile areas are largely glacial in origin. *Lake Peipus*, which forms the eastern boundary of Esthonia, is the remnant of a much larger glacial lake.

Although all three countries produce *timber*, the proportion of forest land is much smaller than in Finland as there has been much cutting. The climate, which is rather extreme, is suitable for growing hardy cereals, and *rye*, *oats* and *barley* are grown. *Potatoes* and other root crops are also grown and *dairying* is being developed, especially in Esthonia and Latvia. The moist climate is very suitable to the production of *flax*, and this forms an important export.

Since separation from Russia the trade of many of the ports has declined, for they have been robbed of a great proportion of their hinterlands.

Tallinn (Revel), the capital and chief port of Esthonia, is on the south shore of the Gulf of Finland. It has manufactures based on local hydro-electric power. *Riga*, the capital of Latvia, a few miles up the *Dvina* from its entry into the Gulf of Riga, is the largest port of these states, and still handles a good deal of Russian trade. *Ventspils* (Windau) and *Liepaja* (Libau) are lesser Latvian ports, which have the advantage over Riga in being ice-free nearly all the year.

Kaunas (Kovno), the capital of Lithuania, is an inland centre on the River Niemen, the chief port being *Memel*, at the entrance to the *Kurisches Haff*, an old German town now re-incorporated in the German Reich.

EXERCISES ON CHAPTER XXXIX

1. Using the following headings write a short account of Denmark :
(a) physical features, (b) climate, (c) occupations of the people. (O.S.C.)
2. Write an explanatory account of the natural and agricultural resources of Sweden. (C.S.C.)
3. Give an account of agriculture in Norway and Sweden and show in what ways position and relief have influenced methods of farming. (C.S.C.)
4. Discuss the geographical factors which help to explain the differences between the chief occupations of Norway and Sweden. (O.S.C.)
5. Discuss the comparative development of the lands on either side of the Baltic Sea.

CHAPTER XL

THE EUROPEAN PLAIN: POLAND

Structure.—Lying between the Alpine area in the south and the North Sea and Baltic Sea in the north are two roughly parallel structural areas—the old plateau remnants of the Hercynian system and the sedimentary lowlands.

The former are widest, highest and most marked in the west and diminish in width and height to the east. The latter gradually widen eastwards. Glacial action has formed the Baltic Heights and the heathlands, which are made of glacial remains, in the north, and south of these are the great valleys of the glacial period which, when drained, provide regions of considerable fertility.

The Hercynian system is important economically owing to the fact that along its edges lie the great coalfields of Europe. These coalfields are shown in Fig. 126, and it will be seen that they stretch from Poland to France, so that details of their development will be found in chapters dealing with several countries.

Climate.—The region, from the climatic point of view, is one of transition, for, going eastwards, temperatures become more markedly

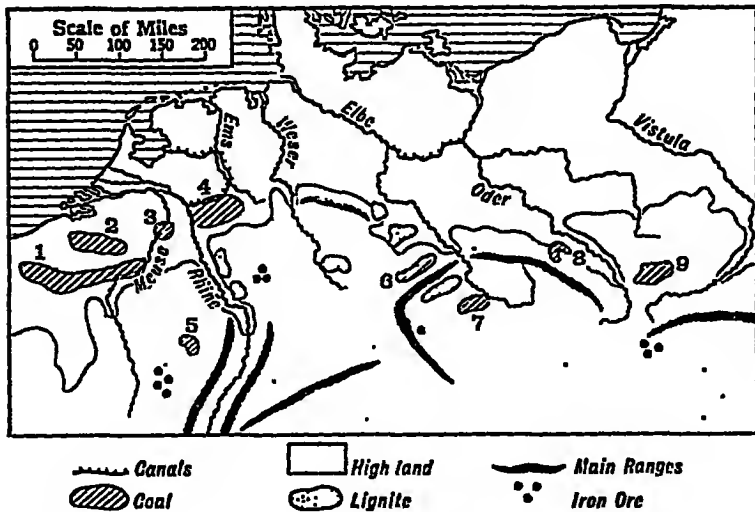


FIG. 126. COALFIELDS OF NORTHERN EUROPE.

Key to coalfields.

- | | |
|-------------------|-------------------|
| 1. Franco-Belgian | 6. Saxony |
| 2. Campine | 7. Kladno |
| 3. Limburg | 8. Lower Silesian |
| 4. Ruhr | 9. Upper Silesian |
| 5. Saar | |

Note—(i) the relation of the coalfields to the highlands ;
(ii) the distance of the coalfields from the sea.

extreme, mainly owing to colder winters, and rainfall also diminishes, with the summer maximum becoming more pronounced.

This plain is occupied by Germany and Poland, two large and important States.

Poland

After ceasing to exist as a State in 1795 Poland was reborn in 1918, and its present territory was formed from parts of the pre-War Russian, German and Austrian empires.

Build.—It stretches from the *Carpathians* in the south to the line of the *Baltic Heights* in the north, and mainly consists of the valley of the *Vistula*.

North of the Carpathian slopes is a low plateau area lying on each side of the upper Vistula. West of the river are the *Uplands of Silesia*, while to the east is the plateau of *Volhynia*, of which the south is drained by the *Dniester* to the Black Sea.

North of this plateau lies the main lowland area of Poland, consisting of the middle Vistula valley, with the valley of the *Warta* (tributary of the Oder) to the west and the *Pripet marshes* to the east.

There is a small area of Baltic Heights in the north, and the artificial tongue of the *Polish corridor* stretching northwards to a short strip of Baltic coast.

It will be seen from this that Poland is essentially a country of the plain, and has only one clearly marked physical boundary—the Carpathians. This partly explains why it was unable to maintain its independence from the stronger empires that surrounded it.

Farming.—With so much lowland, Poland is naturally an agricultural country, more than half its people being peasant farmers. The climate prevents the growth of wheat, save in the south, and the main cereals are *rye* and *oats*. *Root crops* are important, especially *potatoes* and *sugar beet*. There is a surplus of agricultural products. Grain is exported, principally to Germany. *Sugar* is manufactured at *Warsaw* and *Poznan*, and *alcohol* is made from potatoes. In the east of the region and on the Carpathian slopes are supplies of *timber* which still provide a source of wealth, though one which is declining in importance.

Mining.—The plateau area to the south contains much mineral wealth. The *Silesian coalfield*, opened up before the War by German capital and Polish labour, is now crossed by the boundary line between Germany and Poland, but this is ignored as much as possible by the industries concerned. The main mining centre is *Kattowitz*, and the field extends nearly to *Krakow*. There is an export of coal to the Baltic countries and to south-eastern Europe. *Zinc* is mined in this region, and Poland is the chief producer in Europe. Local iron ore led to the development of *iron* and *steel* industries at *Kattowitz*

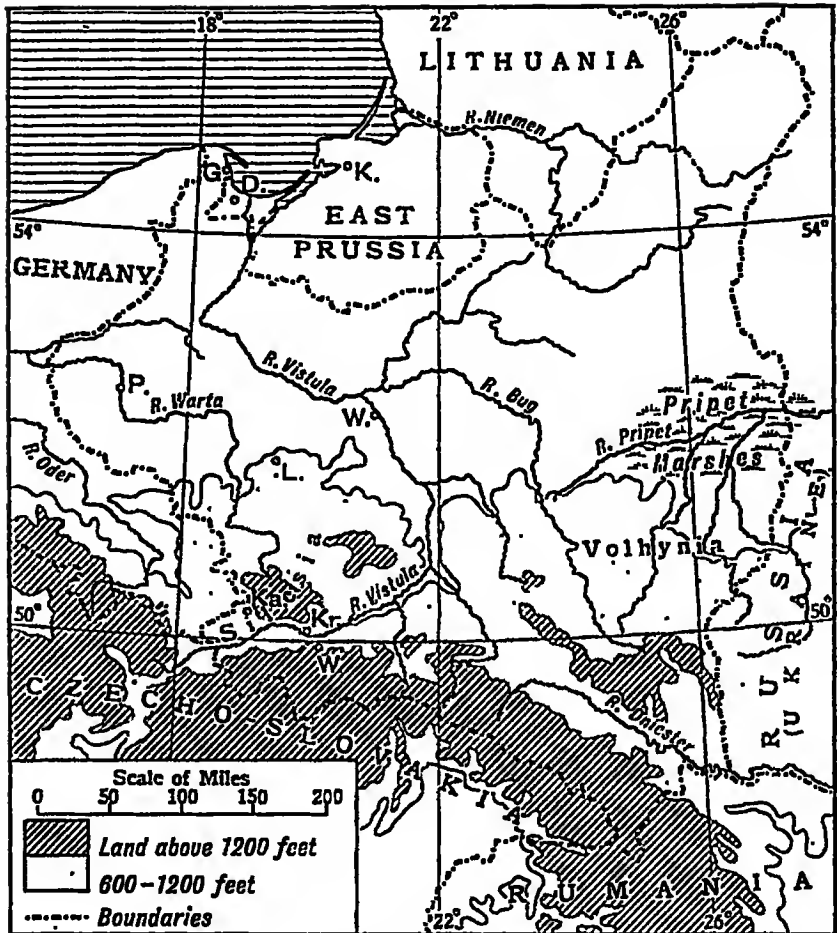


FIG. 127. POLAND.

Identify the towns.

Note complete absence of natural boundaries to east and west.
 Details of the Silesian coalfields are shown in Fig. 129 (page 361).

and *Tarnowitz*. The association of folding and oil deposits is shown here by the *oil field* which stretches along the foot of the Carpathians eastwards from *Krakow*, though the production of oil has declined of late. *Salt* mines are important at *Wieliczka*.

Towns.—The capital of the country is *Warsaw*, which occupies a good site overlooking the river on the central Vistula. It is a railway focus and is at the point where the main west-east route along the plain to Russia crosses the river. It has industries associated with the surrounding agricultural areas. To the west lie the towns of *Poznan* and *Lodz*. Poznan is an agricultural centre with associated industries, but Lodz is the centre of a big textile industry, for it grew up as one of the big manufacturing centres of Russia as the result of the advantages offered by Russian import duties.

The main towns of the southern area have already been mentioned.

Danzig and the Polish corridor.—In order to give Poland access to the sea, a narrow strip of land connecting the main part of the country to the coast was included in Poland, although this involved shutting off East Prussia from the rest of Germany and bringing Germans under Polish rule. The city of *Danzig*, at the mouth of the Vistula, was so definitely German that, to avoid dangers arising from placing it under Polish rule, it was made a free city, with a constitution guaranteed by the other powers. Its trade is largely with Poland but, for various reasons, that country has built the port of *Gdynia* some miles to the north on part of the short Polish coastline, and a railway has been built to serve it.

EXERCISES ON CHAPTER XL

1. In what ways does the climate in Poland influence the life of the inhabitants as regards (a) types of dwellings, (b) clothing, (c) food.

(C.S.C.)

2. What were the problems that Poland was set to solve after her re-founding in 1918? To what extent were these due to geographical factors?

3. What advantages does Poland possess for the development of industries?

CHAPTER XLI

THE EUROPEAN PLAIN : GERMANY

By far the most important State of the European plain is Germany, which came into being after the Franco-Prussian War of 1870, when the many loosely-knit German States were brought together under the rule of the King of Prussia—the largest state—as the German Emperor. After the Great War the empire was replaced by a republic, now in its turn replaced by Nazi rule. As a result of the War, Alsace-Lorraine was returned to France and a considerable area in the east was incorporated in Poland. Its boundaries have since been extended by the inclusion of Austria and large parts of Czecho-Slovakia.

Build

The present area of Germany consists of two main regions, the plain in the north and the highlands in the south.

Northern plain.—The plain shows three distinct regions. Along the *coast* is a *sandy area*, the coast being flat and having many *dunes*. In the North Sea the *Frisian Islands* are parts of the mainland which have been detached as the result of an encroachment of the sea. Along the Baltic shores the west-east set of tidal currents and the general westerly direction of the winds has led to sand dunes shifting along the coast—often covering over fertile land as they do so. Tide and wind have built up the long east-facing sand spits across the mouths of bays. These sand spits or *nehrungs* enclose lagoons, some landlocked, that are known as *haffs*.

Behind this sandy coastline is the region covered with the waste and rubble from the ice sheets. This has led to a region of *infertile heathlands*, chief of which is the *Lunenburger heath* in the west, and the *Baltic Heights* in the east. The only fertile parts are in the valleys of the rivers that break through.

- The third area is the region that drained westwards during the glacial periods and which now contains the westward-turning "elbows" of the main rivers. Much of this region was marshy and swampy, but it has been drained and is now a particularly fertile area.

The highlands of the south are part of the Hercynian system, though in some places subsequent action has led to big changes,

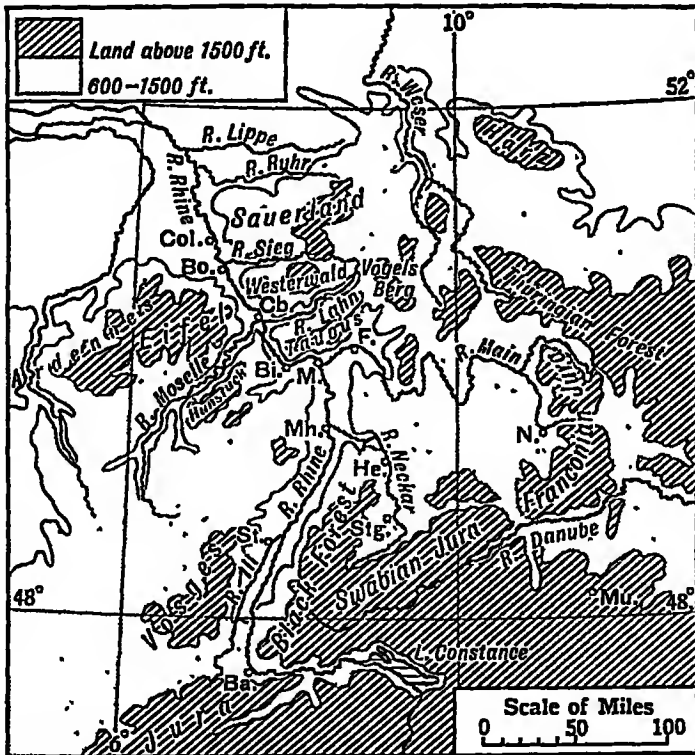


FIG. 128. THE RHINE AND THE SOUTH GERMAN HIGHLANDS.

and this area also includes some of the northern slopes of the Alps. The outstanding feature in this highland system is the Rhine valley in the west.

The *Rhine* is essentially a German river, and though much of its course is outside that country it may well be considered here. Rising in the Swiss Alps it flows through *Lake Constance*, and then flows

west along the edge of the Swiss plateau to *Basle*. Here it turns north and flows through a *rift valley*—the real Rhine valley. This rift valley has been formed by the collapse of an old dome of rock, of which the *Vosges* and the *Black Forest* are the upstanding edges. North of these mountains the edges of the rift have been more worn down and the eastern edge is broken up by the lower valleys of the *Neckar* and *Main* tributaries. The river leaves the rift just beyond *Mainz* and flows in a deep gorge-like valley—the *Rhine Gorge*—which it has eroded in the hard rocks of the *Rhine block*. This block is further cut up by the *Moselle* on the west and the *Lahn* on the east so that it contains four highland blocks, the *Hunsrück* and the *Eifel* on the west and the *Taunus* and the *Westerwald* on the east. After leaving the gorge at *Bonn* the river flows across the plain and finally enters the North Sea, making a joint delta with the *Scheldt*.

East of the Rhine valley there are uplands stretching across to the old plateau of Bohemia. From the Black Forest the *Swabian Jura* and *Franconian Jura* are formed by a limestone ridge, with a north-facing scarp, that stretches north-eastwards and forms a watershed between the drainage areas of the Rhine and Danube. North of the scarp are regions drained by the Neckar and Main and then plateaus formed of hard rocks, very much worn down, such as the *Harz* and *Thuringian forest*, with the volcanic area of the *Vogelsberg*.

Occupations and Productions

Farming.—Until the formation of the German Empire the region was predominately agricultural, and that despite the fact that much of the land was infertile. The development of industry after the formation of the empire aided agriculture by providing a market to stimulate production and by providing it with fertilizers that were the result of scientific discoveries.

The main agricultural regions are the north and the Rhine valley. Throughout most of the country, soil and climate combine to make *rye* the chief cereal, and this is grown in large quantities in the reclaimed river valleys. *Oats* is the main crop in the sandier regions of the plain and is next in importance to rye. *Wheat* is only grown

in some of the more fertile parts in the south of the plain and in the Rhine valley and some of the warmer valleys in the southern highlands. *Maize* is grown to a small extent in the Rhine valley, but almost exclusively as fodder crop.

Sugar beet is the most important cash crop of the country. Germany was the home of the beet-sugar industry and is still the leading producer. It is grown in all parts of the country where agriculture is at all possible, but chiefly in the fertile valleys to the south of the Baltic Heights.

The valleys in the south are warm enough for *grapes*, and wine is produced especially in the valleys of the Rhine and the Moselle, and also in valleys of the Danube, Neckar and Main. In these last three *hops* are grown and there is a considerable *brewing* industry.

Cattle and *pigs* are reared in conjunction with the farming in the plains and valleys. For one thing, the waste from the sugar beet after sugar has been extracted forms an excellent cattle food and this has stimulated cattle and pig rearing. *Sheep* are reared in the sandier heathlands in the north and in the limestone areas of the south.

The old forest blocks are still covered with *pine forests* and these are of value to the country as a whole. The principal *lumbering* region is in the Black Forest, the timber being floated down the river to the industrial areas. There are still some forest lands left in the sandy areas of the east.

Coalfields and industries.—Coal is mined along the edge of the mountain system, and the main coalfields, from east to west, are the *upper* and *lower Silesian*, the *Saxony*, the *Ruhr*, and the *Saar*. In addition to these coalfields there are large *lignitic* deposits in Saxony—and these are now being developed as it is possible to use the lignite in special furnaces for the generation of *electricity* and then to transmit the electricity by cable, whereas the lignite itself could not be exported for industrial purposes.

On these coalfields industrial areas have developed, each showing certain definite distinctions brought about by local conditions. It is most convenient to summarize the industrial developments by coalfields rather than by industries.

The Silesian coalfields.—These consist of two mining regions. The *upper Silesian field* is now shared with Poland. The main German mining centres are *Beuthen* and *Gleiwitz*. Local supplies of *lead* and *zinc* lead to the development of *metallurgical industries* at these towns.

The *lower Silesian field* is on the flanks of the *Riesengebirge*, the mining centres being round *Waldenburg*. Flax, from the Silesian plain, and water-power had led to the early development of *textile industries*, which have been aided by the opening up of the coalfield and are carried on in many small towns at the foot of the mountains.

The Saxony fields.—These are situated on the flanks of the *Erzgebirge*. Coal is mined round *Zwickau*, *Chemnitz* and *Dresden*, while more important in modern



FIG. 129. SILESIAN INDUSTRIAL AREAS. Note the position in relation to the frontiers.

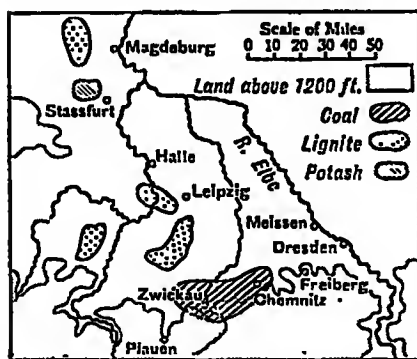


FIG. 130. THE SAXONY INDUSTRIAL AREA.

times are the lignite fields round *Leipzig*. Ore from the *Erzgebirge* ("ore mountains") has led to some *metallurgical industries* at *Zwickau* and *Chemnitz*, but the region is important for old established *textile industries* that are still carried on in small factories. The *Saxony merino* sheep led to *woollen industries* and *Chemnitz* is a big centre for cotton, wool and artificial silk. *Plauen* is noted for lace. *Meissen* is the centre for "Dresden" china. The electric power from lignite and the salt deposits in the neighbourhood of *Stassfurt* at the foot of the *Harz* mountains have led to large *chemical industries* at *Magdeburg*.

The Ruhr coalfield.—This is the largest industrialized area in Europe. Rich coal measures come to the surface in the valley of the *Ruhr*, which joins the Rhine shortly after it flows out over the plain. These coal measures dip below the surface and form a "hidden" coalfield in the valley of the *Lippe*, and the mining areas are gradually moving northwards. In the Ruhr valley there has grown up a vast industrial region containing many big towns—so closely situated as to be almost continuous.

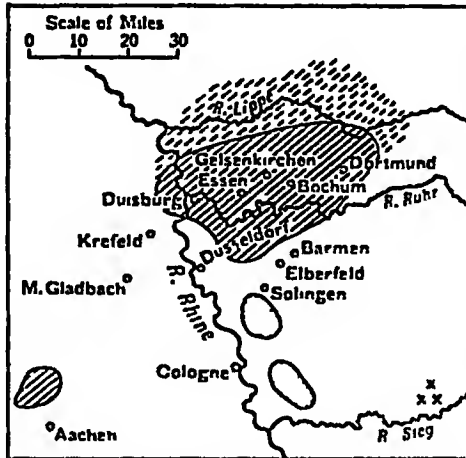


FIG. 131. THE RUHR INDUSTRIAL AREA.

Elberfeld and *Gladbach* are the chief *woollen* and *cotton* centres and *Crefeld* makes *silk* and *artificial silk*. *Dusseldorf* is important for its *chemical* industries.

The navigability of the Rhine has been most important in the development of this region. The chief river ports are *Dusseldorf* and the twin-city of *Duisburg-Ruhrort*, Duisburg building the great steel barges which are so important in the transport along the Rhine.

The Saar coalfield.—After having been administered by France for many years, this area became German again in 1935. The chief mining centre is *Saarbrücken*, and this town has *iron and steel* industries, as well as *glass* works.

To the south, in the valley of the *Sieg* and in *Lorraine* (which was German during the period when the Ruhr area was developing), are rich supplies of iron ore, and these led to the growth of a great *iron and steel* industry which now imports much iron ore. The main iron and steel towns are *Essen*, *Dortmund*, *Ruhrort*, *Bochum*, and *Solingen* (the cutlery centre).

The ability to obtain raw materials easily via the Rhine has enabled this to become a great *textile* centre. *Barmen*,

Natural Regions and Towns

North Germany consists of the plain, with its sandy coastlands, morainic heights and fertile valleys. It is essentially a region of agriculture, but associated with the agriculture are industries such as the manufacture of *starch* and *sugar*, *brewing* and *tanning*. There are two groups of towns: the ports of the coastlands and the market and route centres of the valleys.

The main port is *Hamburg*, which is situated some eighty miles up the *Elbe*, at the highest navigable point and where firm ground comes close to the river. The *Elbe*, with its extensive canal systems connecting it to the *Oder*, gives Hamburg a vast hinterland that extends well into Central Europe. The docks of *Hamburg* extend to the adjoining town of *Altona*.—*Cuxhaven*, at the mouth of the river, is an outpost for liner traffic.

Emden at the mouth of the *Ems*, and *Bremen* on the *Weser*, with its outpost of *Bremerhaven*, are the other North Sea ports. The former has a canal to the Ruhr industrial area and has a considerable trade, while Bremen imports a great deal of cotton.

Although the *Kiel Canal* has made access to the Baltic Sea much easier, the ports of the Baltic coast suffer from their remoteness from world trade routes, and from the danger of ice in winter, an increasingly serious factor to the east. *Stettin*, at the mouth of the *Oder*, is the main Baltic port, and it has a considerable hinterland and does a large trade with the Baltic countries. *Lubeck* has decreased in importance, while *Rostock* is mainly important for the train ferry to Denmark. *Konigsberg* is the capital and chief town of *East Prussia*, which is isolated from Germany by the Polish corridor.

The main inland town of the plain is *Berlin*.—As the capital of Prussia it became the governmental centre of Germany and the focus of its railway system. As the capital it has grown to be the largest city of the country. It occupies a good route position in the centre of the plain. *Hanover* and *Magdeburg* are also route centres in the plain. Hanover has an easy route south via Cassel to the Rhine valley, while from Magdeburg a route goes to the lowlands of Saxony and thence to Bavaria. *Leipzig* is centrally situated in the lowlands

of Saxony, which lie in a kind of bay between the Harz Mountains, the Thuringian forest, and the Erzgebirge.

The Rhine valley.—This has already been described in some detail. The rift valley and the lower valleys of the Main and Neckar are rich and fertile and form the "Garden of Germany". The bordering mountains are still considerably forested. *Mannheim*, at

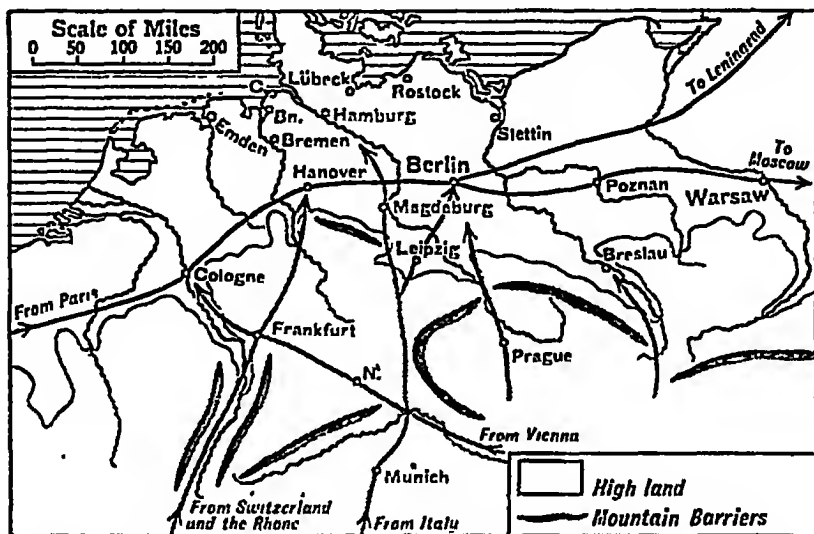


FIG. 132. THE EUROPEAN PLAIN AND THE GERMAN PORTS.
Routes and town sites in relation to rivers and relief.

the confluence of the Neckar, is a city manufacturing machinery and chemicals. *Mainz*, at the confluence of the Main, is a *metallurgical* centre and route town, for the Main gives a good route eastwards to the Danube valley. *Frankfurt-am-Main* is a centre for *chemical industries* and is a big *banking* centre.

Between *Bingen* and *Bonn*—an old university town—the Rhine flows through the Rhine Gorge. The highlands of this region are mainly forested, but in the narrow valleys grapes are important, being grown on terraces on the slopes. *Coblenz* is a route centre where a west-east route via the Moselle and Lahn crosses the Rhine.

The chief town of the Rhine valley is *Cologne*. It is at the site of an old Roman crossing point and is where the main route from Paris

along the European plain, here skirting the highlands, crosses the river. It is an important river port and the commercial centre of the surrounding industrial regions. These industrial regions were described under the Ruhr coalfield.

The southern highlands.—These are comparatively thinly peopled, for only the valleys are capable of much settlement. The higher lands are forested, but in the sheltered valleys of the Main, Neckar, and Danube crops of wheat, barley, sugar beet and hops are grown. Towns are associated with route positions in these river valleys.

Munich is on the route from Berlin to Italy via the Brenner Pass. It is a *brewing* centre and has *electrical* and *textile* manufactures.

The main towns of the Neckar valley are *Stuttgart* and *Heilbronn*, which have *textile* industries. *Stuttgart* is on an important west-east route to the Danube.

The chief town of the upper Main valley is *Nurnberg*, an important route centre and with varied industries, including *toy-making* which has developed from the old wood carving associated with the local timber.

EXERCISES ON CHAPTER XLI

1. Write a geographical account of the various industries of the Ruhr district. (C.S.C.)

2. Select an important textile manufacturing area in Germany. Draw a sketch map of the region showing relief, rivers and towns; give an account of the textile industry in the area in relation to (i) sources of raw materials, (ii) sources of power, (iii) transport facilities. (J.M.B.S.C.)

3. Describe the surface features and drainage of the North German plain. Name three important crops grown on this plain and describe the industries that have arisen in consequence. (L.G.S.)

4. Draw sketch maps to show the relation of the position of Ruhr and Silesian coalfields to near-by highland masses and rivers. Select one coalfield and (a) name the chief manufacturing industries, (b) for one industry state (i) the chief raw materials used, (ii) geographical conditions affecting the industry. (J.M.B.S.C.)

5. Why are the Baltic ports of Germany comparatively unimportant? Give fully the factors that have made Hamburg the principal port of the country.

CHAPTER XLII

HOLLAND AND BELGIUM

Build.—The western end of the European plain was once known as the "Low Countries", a name very descriptive of the greater part of the area, though modern Belgium extends beyond the limits of this old region.

The glacial sands of Western Germany continue into Holland and form a low heathland to the east of the *Zuider Zee*. Sandy material brought by the rivers continues this area into Belgium, where there is a heathland area in the north known as the *Campine*. To the north-west of this is the great lowland of deltaic marsh at the mouths of the *Scheldt*, *Maas* and *Rhine* and round the *Zuider Zee*. This was formed as the result of the land sinking. It is mainly below sea-level and during the Middle Ages the sea broke through the dune barrier of the coast and formed the *Zuider Zee*, leaving the higher dunes standing up as the *Frisian Islands*. This marshland area has been reclaimed by building dikes to keep out the sea and river floods and then pumping the enclosed *polders*. Now man is busily engaged in winning back the land lost when the *Zuider Zee* was formed. This lowland area led to our name for Holland (Hollowland).

South-west of the *Campine* lies the *Belgian plain*, drained by the river *Scheldt* and its tributaries. In the west is the sandy plain of *Flanders*, which has been cultivated carefully so that it is now fertile. Further east is the plain of *Hainault* and *Brabant*, covered with deposits of a fertile "loam" (sand and clay) which stretches into France and is known locally as "limon".

In the south-east of Belgium is the highland region of the *Ardennes*, a part of the Hercynian system, consisting of hard rocks in the south and limestone in the north.

On the edge of this high land the coal measures are found again, and in Belgium they occupy the line of the *Sambre-Meuse* valley.

Climate.—Lying near the sea the region suffers only slight extremes of climate and has a sufficient and well-distributed rainfall—between twenty-five and thirty inches—so that it can be considered typically Cool Temperate Western Margin.

Holland

Occupations and productions.—Situated at the mouth of the Rhine and well placed on trade routes, Holland has a good position for trade and commerce. Its people have always taken a prominent part in maritime enterprise and, as a result, there is a large colonial empire in the east.

The level plain causes the country to be almost entirely devoted to agriculture. The polder country makes excellent cattle pasture and, though *cereals* and *sugar beet* are grown, *dairy farming* is the main occupation in modern times and there is a considerable export of dairy produce. In the *Haarlem* district there is a big *horticultural* area, the flower bulbs being famous.

The sandy lands in the east are being gradually reclaimed by careful cultivation and *root crops* can be grown. *Sheep rearing* is still important in some areas, but *cattle* and *pig rearing* are on the increase.

The *Limburg* district extends far enough south to reach the coal measures, and *coal mining* has developed during the present century.

As the result of colonies and maritime enterprise there is a considerable overseas trade, while the transit trade to Germany via the Rhine is of great importance. Local raw materials led to the development of some industries, and nowadays raw material is imported. *Utrecht* is noted for *linen* and *textiles*, *sugar* is made at *Amsterdam*, as also is *cocoa*. Shipbuilding is carried on at *Rotterdam* and *Amsterdam*, and there is a big *brewing* and *distilling* trade.

Towns.—The capital is *The Hague*, which lies in the centre of the true "Holland". The commercial centre is *Amsterdam* on the *Zuider Zee*, but now connected to the North Sea by the *North Sea*

Canal, which comes out at *Ijmuiden*. Owing to its trade Amsterdam is a busy manufacturing centre, and its wealth and early connections

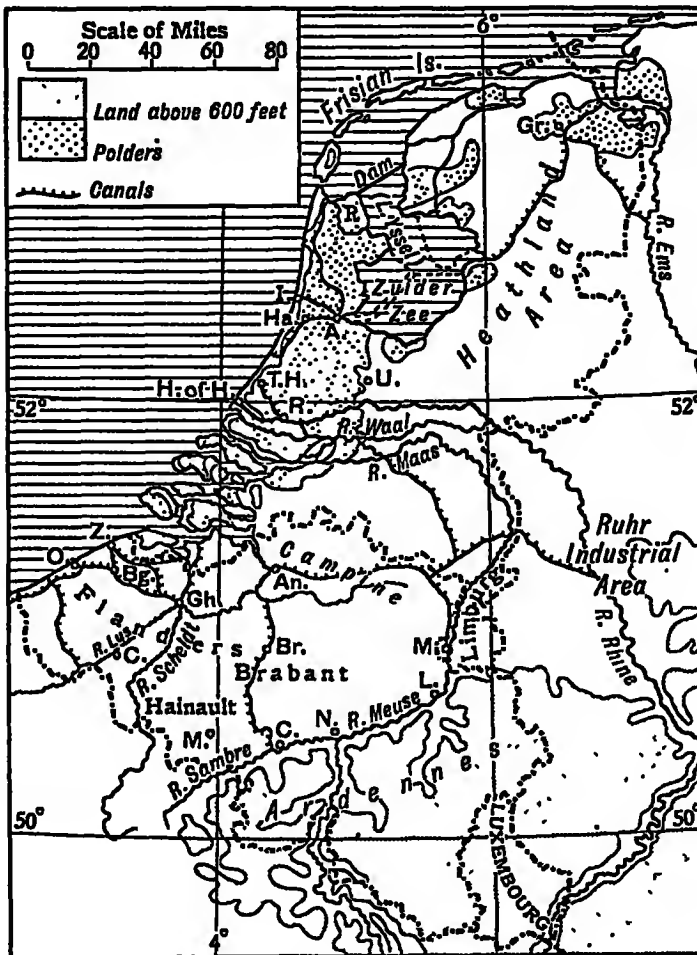


FIG. 133. HOLLAND AND BELGIUM.

Identify the towns.

- Note—(i) the Zuider Zee reclamation. Dotted lines mark future "polders".
 The area marked R has already been reclaimed.
 (ii) the position of Holland in relation to the Rhineland.

with the Indies have made it a famous *diamond market*. *Rotterdam*, though not on the main Rhine distributary (the *Waal*), is the main transit port for the Rhine traffic. An artificial waterway, at the

entrance of which is the *Hook of Holland*, a packet station, enables it to retain its trade.

The main town in the east is *Groningen*, which is the centre of an isolated polder region. *Maastricht* is the chief town in the mining district of Limburg.

Belgium

Farming.—In the plains of the west farming is the main occupation. They form one of the most densely peopled agricultural areas in the world. The cultivation is consequently most intensive, much work being done by hand. *Wheat* and *sugar beet* are the main cash crops in the plains of Brabant and Hainault, while in Flanders *root crops* for fodder and *flax* also play a part.

The Ardennes region is mainly of poor soil and the climate is rather cool and wet, so that there is still much forest. In the fertile valleys of the north farming and cattle rearing are important.

Industry.—For many centuries Flanders was the home of industrial towns, for *Ghent*, *Brussels* and other towns of the plain were long famous for their manufactures of local flax and imported wool (from England).

The *coalfield* of the *Sambre-Meuse* valley enabled modern Belgium to carry on the tradition. *Coal mining* takes place principally round *Mons*, *Charleroi* and *Liège*. Recently a fresh coal area has been developed in the *Campine* district, the seams here being very deep. In the main coalfield they suffer from having undergone considerable folding.

As a result of the coalfield there is a long narrow *industrial belt* from *Mons* to *Liège*. *Iron ore* is easily obtainable from the Ardennes and from Lorraine, so that *Charleroi* and *Liège* are smelting and *iron-working* centres. There are also *chemical*, *glass* and *earthenware* factories. *Verviers* is a *wool* manufacturing centre, though most of the wool used is now imported.

The old industries of the plain have been mentioned. *Ghent* and *Courtrai* are still noted for *linen*. This is partly owing to the fact that the stem of the flax plant requires to be retted by soaking in soft

water containing humus, and the water of the River *Lys* is noted for this purpose. *Cotton* is imported and manufactured at *Ghent*.

Low labour costs and cheap transport enable Belgium to export manufactured goods and there is a big import of foodstuffs and raw materials.

Towns.—The capital is *Brussels*. It is centrally situated in the plain of Brabant, being chosen as capital when Belgium was created from Flanders, where the people speak Flemish, and Brabant, where the people speak French. It is the centre of the railway system and has canals to the coalfields and to the Scheldt.

Antwerp, some fifty miles up the Scheldt, is the main port and also has a large transit trade to Germany and North France.

Bruges, an old Flemish town, is connected by canal to its outport of *Zeebrugge*.

Ostend is a packet station and a coastal holiday centre.

Luxembourg.—Situated to the south of the Ardennes is the small independent Duchy of Luxembourg. It is united with Belgium in a customs union, and its main production is *iron ore*.

EXERCISES ON CHAPTER XLII

1. Compare and contrast Holland and Belgium under the headings (a) build, (b) climate, (c) agriculture.
2. Both Holland and Belgium have manufacturing industries—but for different reasons. Give an account of the manufacturing industries of the two countries so as to explain this statement.
3. What geographical facts have caused Belgium so frequently to be “the cockpit of Europe”?
4. Explain the distribution of farming occupations in Holland and Belgium.

CHAPTER XLIII

FRANCE

FRANCE can be regarded as the connecting link between Northern and Southern Europe, for in the north it merges into the western end of the European plain, its central areas are made up of old Hercynian remnants, and its southern and eastern borders belong to the Alpine system. In the same way its north-western coastline faces the English Channel while in the south it has a coastline on the Mediterranean.

Build and Climate

Highlands.—The central core of the country is the old Hercynian remnant known as the *Central Massif*. This consists of old hard rocks, with limestone in the north and south-west. The eastern edge has been most uplifted so that the highland edge known as the *Cevennes* overlooks the Rhône valley on the east, while the main rivers drain westwards from this edge. Northwards the *Loire* and its tributary the *Allier* have cut broad and fertile valleys, while to the west drain the *Dordogne* and several right bank tributaries of the *Garonne*. To the west of the valley of the *Allier* there are many signs of volcanic activity, including the remnants of old cones and *crater lakes*. Where the rivers cross the limestone areas deep gorge-like valleys have been formed and there are many caverns.

Apart from the central massif other Hercynian remnants are *Brittany* in the north-west, where the old rocks are very much worn down, and the *Ardennes* and the *Vosges* in the north-east, which have already been mentioned in Chapters XLI and XLII. Between the *Cevennes* and the outlying folds of the *Alps*—which form the most easterly part of France, is the narrow *Rhône-Saône* valley.

In the south are the Alpine folds of the *Pyrenees*, which form the boundary with Spain.

Lowlands.—Between the *Pyrenees* and the central massif lies the lowland area drained by *Garonne-Dordogne* system. This is a fertile lowland of recent rocks. In the west, on the coast of the Bay of Biscay, is a region of sand dunes. To prevent these moving inland pine trees have been planted. This region is known as the *Landes* and along the coast are a series of lagoons known as *étangs*.

The chief lowland of France, however, lies in the north. Here, in the angle between the central massif, Brittany, and the eastern highlands a series of sedimentary rock layers were formed. Subsequent movement led to the outer edges of this region being tilted up, so that the rock layers are saucer-shaped with the youngest rocks in the centre. There is a complete circle of chalk forming the Paris basin, while to the south and east the limestone layers follow the same formation. The inner slopes of the basin thus consist of gentle dip slopes, while the steeper scarps face outwards. The central part of the basin is very largely covered with the fertile *limon* soil.

Climate.—Just as France is transitional in structure it is also transitional in climate, for while the major portion of the country lies in the cool temperate western margin of the continent it extends into the Mediterranean climate area. Being thus situated, France has a good climate for, while it has a sufficient and regular rainfall, it has long warm summers, so that conditions for agriculture are everywhere good. The importance of relief in climate is illustrated by the lower temperatures and higher rainfall of the central massif as compared with the lowlands to the west.

Productions and Occupations

France has a large area of lowland as compared with its size, and the lowland areas are mainly very fertile. Reference has just been made to its good climate. Consequently agriculture is the predominating occupation of the country. As the result of the Revolution the ownership of much of the land is in the hands of peasant farmers. Inheritance laws have resulted in considerable subdivision, so that a great deal of the land is cultivated intensively.

Farming.—*Wheat* is the main cereal and is grown principally in the fertile lands of the Paris basin, the Loire valley and the Saône valley. France is able to grow nearly enough wheat to supply her own needs, a rather unusual state of affairs for a country in western Europe.

Oats replace wheat in the wetter areas of the west, while in the south-west the hotter summers enable *maize* to become an important crop.

The farming system is based on crop rotation, so that *root crops* are everywhere important. Apart from those grown as winter fodder for cattle, and potatoes, the main root crop is *sugar beet*, which is also grown chiefly in the northern areas.

France is especially famous for the production of *wine*. The *vineyards* are not confined to the Mediterranean areas of the south but are found in all regions where suitable soil and warm southern aspects make production possible. The most famous wine, *cham-pagne*, is produced from vines grown on fertile soil at the foot of the chalk slopes round *Epernay* and *Reims*. *Burgundy* is produced on the southern slopes of the limestone area, which are known as the

Côte d'Or and overlook the Saône valley.

The *Loire* valley produces *white wines*, while *clarets* and similar wines come from the region round *Bordeaux*, particularly the peninsula of *Medoc* to the west of the *Gironde* estuary.

The biggest area for vineyards is in the lower Rhône valley, though the wines produced are not so world famous.

The mild climate of *Brittany*, with its comparatively early spring, is ideal for producing *flowers* and *vegetables*. These

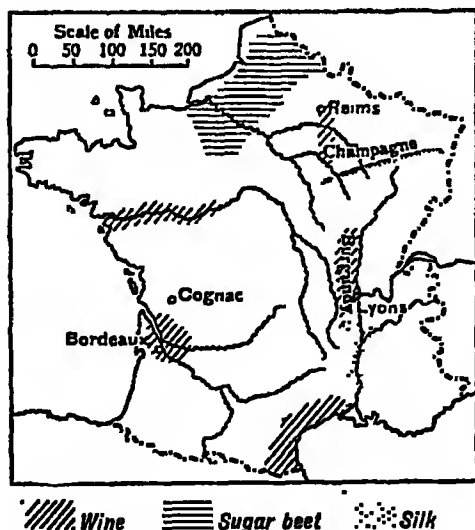


FIG. 135. SPECIALIZED AGRICULTURAL PRODUCTS OF FRANCE.

are ready earlier than those of the Paris basin or England and there is consequently a big production for these two markets. *St. Malo* is the main centre for the export trade to England.

Apples, used for cider making, are grown in *Brittany* and *Normandy*, and *olives* are grown in the lower Rhône valley. The intensive farming and crop rotation system has led to a large amount of *cattle rearing*. The only areas in which there is any specialization on cattle rearing alone are in the wetter north-west and in mountain areas in the central massif and the Alps, where upland pastures are important. *Sheep* are reared on the central massif and on the chalk and limestone hills surrounding the Paris basin.

Mining and industry.—Although France is mainly agricultural, it has considerable mineral deposits and in many areas industries have been important for centuries.

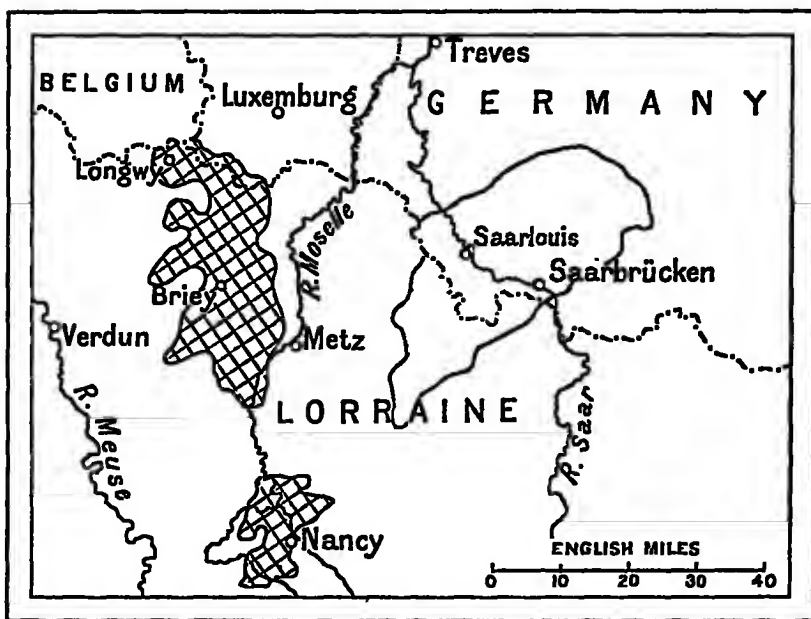
Coal is mined principally in the north, where coal seams continuing those of South Belgium are found. The seams are deep and distorted but, as the pits had to be re-equipped after the ravages of the Great War, this is offset by modern methods of mining. Apart from this field, there are small fields near *St. Etienne*, *Le Creusot* and *Alais* in the central plateau.

Iron ore deposits are found in two areas. In the plateau of the Lorraine, restored to France after 1918, are situated some of the richest ore deposits of the world. The rich "minette" ore is mined round *Nancy*, *Longwy* and *Briey*. Much of this ore used to be sent to the Ruhr valley, much of it now goes to the north of France.

A more recent development is the opening up of new iron ore deposits round *Caen* in Normandy, and there is iron ore in the central plateau.

There are important *potash* deposits in Alsace near *Mulhouse*, and in the south are deposits of *bauxite* from which aluminium is extracted.

The chief industrial area is situated on the northern coalfield, where the coal has helped to revivify the ancient Flemish industries. The centre of this region is *Lille*. This town is the centre of the *textile* industry which was based on local supplies of flax and wool, but now these and cotton are imported. *Armentières* is the *linen* centre, while



Stanford's Geog. Estab., London.

FIG. 136. THE IRON DISTRICTS OF EASTERN FRANCE.

Tourcoing and Roubaix make wool. Iron goods are made at Lille and Douai.

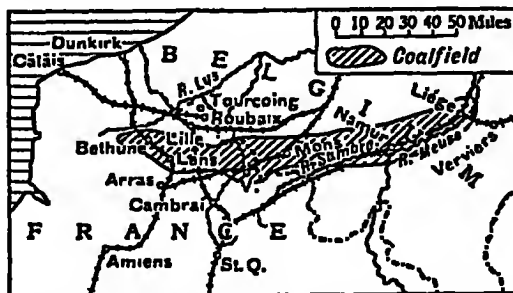


FIG. 137. THE FRANCO-BELGIAN COALFIELD AND INDUSTRIAL AREA.
Note how the region lies across the frontier.

Chemicals for fertilizers, sugar from beet, and agricultural machinery, are made at Amiens and St. Quentin, which also have small textile industries.

Apart from this region there are many isolated manufacturing centres. *Rouen*, at the mouth of the Seine, has an important *cotton* industry, for its damp climate and easy access to imported cotton led to the industry growing up from the old wool weaving industry of Normandy.

Sheep rearing on the chalk hills led to wool manufacture at *Reims* and *Epernay*. In the Vosges water-power caused the development of *textile* industries, which were able to supplement local wool supplies with cotton imported via the Rhine. The chief centres are *Mulhouse*, *Belfort*, *Epinal* and *Colmar*.

Lyons is famous as the centre of a big silk industry. Silk worms are reared locally on the sheltered hill slopes, power being obtained from the coalfields of St. Etienne and the water-power of the Alps.

The coal of the central plateau has led to *iron* industries at *Le Creusot*. *St. Etienne* makes *ribbon*, *Clermont-Ferrand* makes *motor tyres* and *Limoges* is famous for *porcelain*. In the Alpine area water-power is utilized for *textile* industries in some of the smaller towns and villages, while *Grenoble*, on the Isère, makes *gloves* from the skins of mountain sheep.

Natural Regions

The well-defined physical regions of the country divide it into clearly marked natural areas distinctive in occupation and development.

The Paris Basin.—The structure of this region has already been outlined. It is mainly agricultural, and the occupations are determined very considerably by soil conditions. The limon covered areas of the centre are rich farmlands, which have a ready market in Paris. The chalk areas, where not covered with limon, are noted for sheep rearing, principally in Normandy and near Reims. The sheep rearing region near Reims is known as the "Dry Champagne" country, to distinguish it from the "Wet Champagne" of the clay valley between the chalk and the limestone.

In the north the basin gives way to the agricultural district of Flanders and this northern area is principally important for the industrial region connected with the coalfield.

Paris, the capital of the country, grew up at an easily defended point round an island in the Seine. Its central position in the basin made it the chief town of the area ruled by the early French kings, and it remained the capital owing to its ease of access from all parts of the country. The converging routes are shown on Fig. 138. The routes

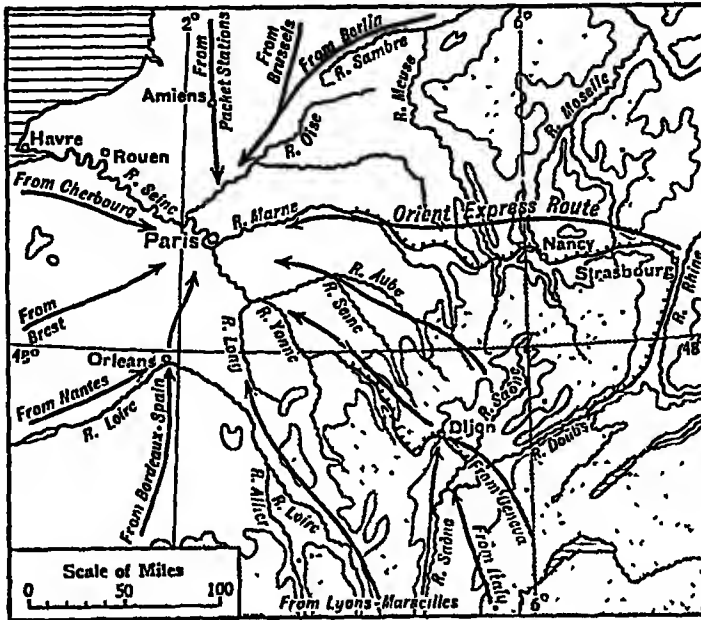


FIG. 138. ROUTES AND CANALS CONVERGING ON PARIS.

Note—(i) its central position in relation to river systems;
(ii) the course of the Saône in relation to the rivers of the Paris Basin.

from the east and the important Gap towns that guard the routes should be noted. As capital and route centre it has become the main focus of road, rail and canal routes, and is an important air centre in modern times.

Rouen, the old port of the region, is now too far up the Seine and the modern port is *Le Havre*, on the north bank of the estuary. Both towns manufacture cotton. Along the coast, *Calais*, *Boulogne* and *Dieppe*, are the packet ports that serve England, and in the extreme north *Dunkirk* is of growing importance as the port of the coalfield.

In the middle valley of the *Loire*, which belongs structurally to the Paris basin, there are many very fertile stretches, with, however, several comparatively infertile regions.

Orléans and *Tours* are both very old towns which have grown up owing to their position on the important route from Paris southwards to Bordeaux and Spain via the *Poitiers* "gate" between the central plateau and the western highlands.

North-Western France.—This consists largely of the peninsula of *Brittany* and includes the *Cotentin* peninsula of Normandy and the lower *Loire* valley. Its development is the combined result of its old rock structure, which causes a good deal of the surface to consist of infertile moorlands of no great height with rich valleys lying between them, and a mild oceanic climate consequent upon its position.

The long coastline, with the many islands formed by the land sinking and "drowning" the lower valleys of the river, is also important. The climate leads to a concentration on dairying and the production of early vegetables. The long coastline combined with large areas of infertility have resulted in the development of *fishing*, and the *Bretons* are noted sailors. It should be remembered that there is racial as well as geographical affinity between this region and south-western England.

The chief town is *Rennes*, which controls the main route into the peninsula and a north-south route across its base. *Brest* is an important naval harbour. *Cherbourg* is a liner port owing to its position in relation to the international shipping route along the English Channel. *Nantes* is an old port at the head of the *Loire* estuary and imports colonial produce. *St. Nazaire*, to which there is a canal, is its outport and a shipbuilding centre.

Eastern France.—This consists of the provinces of *Alsace-Lorraine*, which, after being under German rule from 1870 to 1918, have since been restored to France. Lorraine is really the limestone scarp area that continues the Paris basin, while Alsace consists of the old rock area of the *Vosges* and the western part of the *Rhine* rift. Lorraine is chiefly important for its iron deposits, though there is some sheep rearing and there are vineyards overlooking the *Moselle*.

The Vosges are considerably forested, but the plain overlooking the Rhine is fertile. The area next the river itself is swampy and the most fertile region lies at the foot of the mountains and produces grapes, tobacco and hops.

Strasbourg grew up on the *Ill* and now extends to the Rhine. It commands the important route to Paris via the *Saverne gate* and *Nancy*, and has an easy route to the Rhône-Saône valley by the *Belfort gate*.

Apart from the textile centres of the Vosges and the iron centres of Lorraine there are no other important towns, but the important route positions of *Metz*, *Nancy* and *Belfort* should be noted.

The central massif is mainly an infertile region. The hard rocks do not provide fertile soil, but provide some cattle pastures. The limestone areas of the *Causse* in the south provide sheep pastures. The mainly agricultural lands are in the valleys of the Loire and Allier, but the chief towns are connected with the St. Etienne coalfields and have already been mentioned. The volcanic area attracts a considerable tourist traffic.

The Garonne basin.—Often known as *Aquitaine*, this is a region of fertile soil and good climate, and is noted for its production of wine, wheat and maize. The big centre of the wine trade is *Bordeaux*, situated on the Garonne just before it enters the *Gironde* estuary, into which the waters of the Dordogne also flow. The *Charente* valley is also in this region and is important for the production of brandy, *Cognac* being the centre. The upper Garonne leads to a natural route to the Mediterranean between the Pyrenees and the central massif. This is known as the *Gate of Carcassonne* from the old castle town in the centre of it. The chief route town now is *Toulouse*, on the Garonne, and from it runs the *Canal du Midi* to link this area with the Rhône.

The Rhône-Saône valley.—This has always been important owing to the magnificent route it affords between the Mediterranean and Northern Europe. It is a narrow valley, and in the south is typically Mediterranean in type, but the Mediterranean region ends at *Montélimar*. An important feature in the valley is its liability to the *mistral*—a cold wind that blows down it from the north in winter.

The Saône valley is noted for wheat, but the Rhône valley is important chiefly for its silk industry, which is centred in *Lyons*. Much raw-silk is imported, but Lyons has the benefit of an old established industry with coal near-by at St. Etienne and water-power from the Alps. It is also an important route town, having easy routes to Paris, the Rhine, to Switzerland via the Rhône, and Italy. *Dijon* is the main centre and route town of the Saône valley. In the south are many old Roman centres, chief of which are *Nîmes* and *Avignon*.

The Rhône forms a delta and an east-west current causes the site for the main port to lie to the east—*Marseilles* at the head of the *Gulf of Lyons*. It is connected to the Rhône by a canal. Since the opening of the Suez Canal it has become the chief port of France, and has a large trade with colonial possessions in Africa and the East. Local olive oil with imported colonial produce lead to a big manufacture of soaps and perfumes.

The Alps and the Jura.—These form the eastern boundary of France, and are regions of typical mountain development. Dairy cattle are reared, making use of upland pastures in summer and being fed with fodder crops grown in the valleys in winter. Population is comparatively small. There is some manufacture in the water-power centres of the Alps, chiefly at *Grenoble*, which is the main town of the Alpine area. *Besançon*, on the *Doubs*, in the Belfort gate, is the main centre for the Jura region.

Along the Alpine coastlands and sheltered from westerly influences to a certain extent by the trend of the coast, lie the famous holiday resorts of the *Riviera* coast, chief of which is *Nice*.

EXERCISES ON CHAPTER XLIII

1. Draw a sketch map of the Rhône basin showing (i) the principal routes leading to other parts of France and the Rhine, (ii) four important towns. (L.G.S.)
2. Compare the portion of the valley of the Rhône below Lyons with the portion of the valley of the Rhine below Cologne under the heads : (a) relief, (b) occupations, (c) towns. (C.W.B.S.C.)

3. Marseilles has been an important city since ancient times. How far have geographical conditions affected its position and growth?

(O. and C.S.C.)

4. Describe the physical and climatic features of the whole area drained by the Saône and the Rhône and show how they affect the occupations of the people.

(C.S.C.)

5. Select an important textile manufacturing area in France. Draw a sketch map of the region showing relief, rivers and towns. Give an account of the industry in relation to (i) sources of raw materials, (ii) sources of power, (iii) transport facilities.

(J.M.B.S.C.)

6. State the part played in the economic life of France by each of *three* of the following : (a) Lorraine, (b) Algeria, (c) the Riviera, (d) the Seine river system, (e) the Rhône corridor south of Lyons. (J.M.B.S.C.)

CHAPTER XLIV

THE ALPS AND SWITZERLAND

THE main barrier between Northern and Southern Europe is the young folded *Alpine mountain system*. This was formed by the folding of the sedimentary layers that once occupied a big trough between the Hercynian areas and Africa. The folding was very intense, so that folds were thrust over one another and the old hard granitic core was in places brought to the surface. The folding was responsible for the main direction lines of the present mountain chains but weathering has determined the chief physical features of modern times. Fig. 120 shows the way in which the Alpine folds system forms a series of great arcs to the north of the present Mediterranean basin.

The heart of the system lies in Switzerland, though it is equally true to say that Switzerland lies in the heart of the system. Here are the culminating peaks and here glacial action has eroded the hard rocks of the granitic core into the most rugged outlines, for during the glacial period this part of Europe was of a sufficient altitude to have marked glacial conditions.

In these central regions of intense folding the core of the Alps is of *granitic material* but on the flanks of this core are *limestone* ridges and outside these *sandstone* areas. Near the foot of the Alps are many *lakes* which have been formed by glaciation.

The main chains are high enough to have perpetual snow, and most of the region is snow-clad in winter. There are thus many *glaciers* which are still carrying out the work of erosion.

Switzerland

Build.—Switzerland, which grew up as an independent country round the four "cantons" or valleys that lay round Lake Lucerne, now includes three distinctive regions.

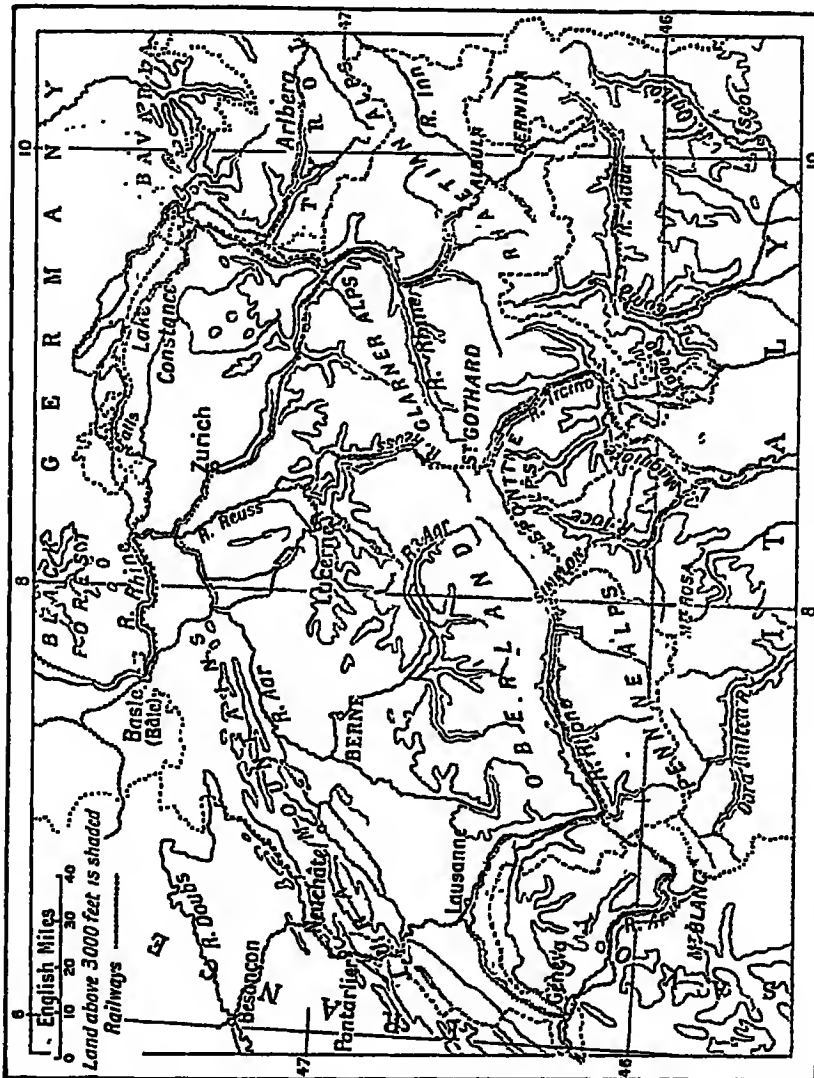
In the south-east is the *Alpine area*, centred mainly round the *St. Gotthard* massif. From this core the valleys of the *Reuss*, *Rhine*, *Ticino* and *Rhône* go outwards at right angles to one another. The main valley is that of the Rhône ("Valais") which lies between the *Bernese* and *Penine Alps*.

To the north-west are the limestone folds of the *Jura*, which are associated with the Alpine folds. Between these and the Alps lies the *plateau* drained by the *Aar*, a tributary of the Rhine, though it is really a region of considerable erosion and is merely a plateau in comparison with the neighbouring areas.

Climate.—Altitude naturally plays a big part in the climate of Switzerland, and aspect is also of great importance. Southern slopes are warmer than northern, while western areas are wetter than eastern. Hence the height of the snowline varies from one side of a range to another. The valleys are warm and sheltered, though the bottoms of the valleys are often cold in winter.

Occupations.—**Farming.**—Switzerland is able to maintain a surprisingly large population. This is due to adaptation to surrounding conditions. Agriculture is most important on the plateau. Some *wheat* is grown, but *root crops* and *hay* are now of greater importance owing to a concentration on *dairy farming*. In the Alpine areas there is a highly specialized type of farming. The valleys are used for the production of *fodder crops*, though *vines* are grown in a few favoured areas. Up the slopes are forest zones which protect

the valleys from avalanches. Above the forests are the areas which are free of snow only for limited periods, the mountain meadows providing summer pasture and known as *alps*.



Stanford's Geog. Estab., London.

FIG. 139. SWITZERLAND

Cattle are kept in stalls in the winter but move up to the summer pastures, first to the *vorarlps* and then to the *alps*. Here they are kept all the time, the milk being made into *cheese* and sent down to

the valleys. In the *Jura* there are similar occupations, but *vines* are grown on the south slopes.

Industry.—Although lacking coal or minerals, Switzerland is now predominatingly an industrial country. During the long winters the inhabitants developed home industries, and now their skill is utilized in factories which are driven by *hydro-electric power*. Raw materials have to be imported and come mainly via the Rhine or Genoa. To make up for transport difficulties, the industries are chiefly of the type where the *skill* of the workers makes them valuable.

The chief industries are the *cotton* and *silk* manufactures of *Zürich*, *Basle* and *Lucerne*. Cotton is imported via the Rhine, but much of the silk comes from Italy.

Geneva and *Neuchâtel* are noted for their manufacture of *watches* and *clocks*.

The dairying occupations of the plateau give rise to the *chocolate*, *condensed milk* and *cheese* manufactures of *Lucerne* and *Berne*.

Zürich also makes *machinery*, both in connection with the *textile* industries and *electrical engineering*, while *Basle* has *dye-works*.

One of the most important of modern industries is that of catering for *tourists*, who come for the scenery in summer and for sports in the winter. The numerous tourists and the specialization of modern Swiss farming are together responsible for a considerable import of grain and other foodstuffs.

Towns.—*Berne*, the capital, occupies a central position in the plateau, on a route between the Rhine and the Rhône and with a route south via the *Lötschberg* tunnel under the Bernese Alps.

Basle is a very important route centre at the south of the Rhine rift valley, and is a big railway junction.

Geneva, situated at the point where the Rhône leaves Lake Geneva, is an important route centre in relation to routes from the Rhône basin. Its central position, combined with its being in a country which has always maintained its neutrality, has made it a centre of international organizations, chief of them being the League of Nations.

Neuchâtel controls the only good route across the *Jura*.

EXERCISES ON CHAPTER XLIV

1. What are the main divisions of the Alps? Write a short description of each and illustrate your answer by sketch maps. (S.L.C.)
2. In what way does Switzerland offer a splendid example of the control of human beings by environment?
3. Write an account of the industries of Switzerland so as to bring out (i) the sources of raw material, (ii) the sources of power, and (iii) the geographical reasons for the growth of each industry.

CHAPTER XLV

MEDITERRANEAN EUROPE

THE Alpine folds, having originated in a depression of which the present Mediterranean is only a small remnant, now shut that basin off from the rest of Europe and give it very distinctive features of its own.

Structurally, the three peninsulas which go to form the area—the *Iberian* in the west, *Italian* in the centre and *Balkan* in the east—are alike in having a large proportion of high ground and in having only isolated areas of plain. General outlines of structure have been given, and more detailed study can be left to be dealt with in each region.

Climate.—Climatically, the results have been most important. The presence of such a large area of inland sea is bound to be important anywhere and, lying as it does in the transitional latitudes of the *warm temperate* belt, it is here most important. The west-to-east structure line of the Alpine folds keeps these regions shut off from cold influences from the north except for certain occasional irruptions. There is scarcely any need to mention that these Mediterranean regions have a warm temperate western margin climate with winter rain, for they give the general name to such areas.

Nevertheless, these lands actually possess certain definite local features.

During the *winter* the Mediterranean is a region of low pressure lying between high pressure areas over Europe and Africa. *Cyclones* in the westerly wind stream are able to enter this low pressure area by the natural gaps of the *Straits of Gibraltar* and the *Gate of Carcassonne*. These cyclones bring most of their rain in autumn and

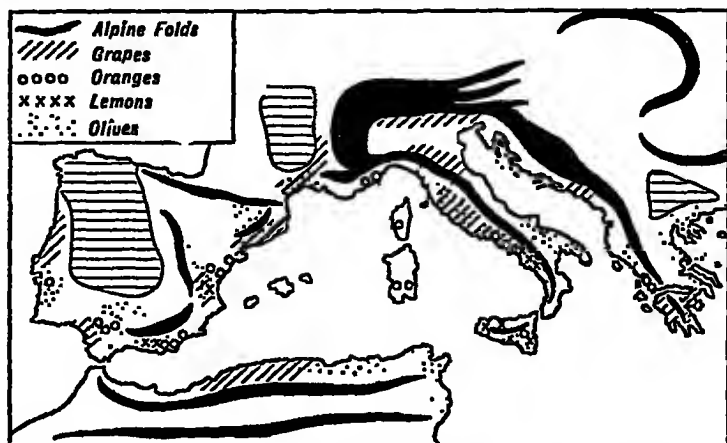


FIG. 140. SOUTHERN EUROPE.

The Alpine folds and typical products, which help to illustrate the unity of the area.

there is another maximum in spring. Further, it is these cyclonic depressions that cause the local winds of the region. Thus the *mistral* of the Rhône valley and the *bora* of the Adriatic are *cold winds* pulled into the area from the cold lands of Europe by the northerly air streams behind a cyclone. The *leveche* of Spain and the *sirocco* of South Italy are *hot dusty winds* which, in spring, are pulled into the area from the Sahara by the air streams in front of cyclones.

In *summer* winds blow from the Azorean high pressure and its extension over Europe towards the low pressures over the Sahara and India. These winds are northerly and, while strong, are dry, so that there is no rain and much sunshine.

It should be scarcely necessary to add that the climate is reflected in the evergreen drought-resisting type of vegetation.

The Iberian Peninsula

The Iberian peninsula is the most western of the three peninsulas that form Southern Europe. Lying as it does between Atlantic and

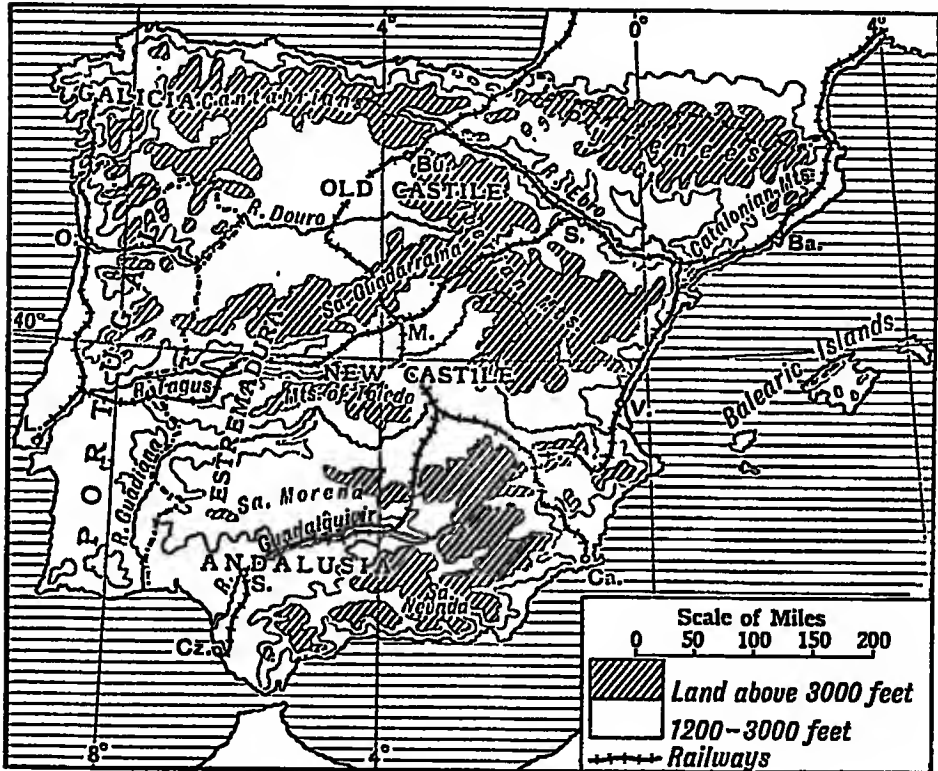


FIG. 141. THE IBERIAN PENINSULA.

Identify the towns.

- Note—(i) how physical features influence routes;
(ii) the route positions of Madrid, Burgos and Saragossa.

It should be remembered that Spanish railways are broad gauge.

Mediterranean, it is transitional between the two, both from the point of view of climate and also in historical development.

Build.—The main feature of the build is the plateau known as the *Meseta*. This is an old rock area, partially covered with young

rock layers, which slopes westwards. The earth movements that led to the Alpine folds resulted in considerable faulting in the plateau. This led to the formation of the *Central Sierras*, chief of which is the *Sierra de Guadarrama*, and of the *Sierra Morena* in the south. In the north-west *Galicia* is an old area similar to Brittany, while the *Cantabrians* are Hercynian.

North of the Central Sierras the basin of *Old Castile* is drained by the *Douro*, while south of them the basins of *Estremadura* and *New Castile* are drained by the *Tagus* and the *Guadiana*, between which lie the *Mountains of Toledo*. These rivers reach the Atlantic across the coastal plain of Portugal.

In the north-east of the Meseta is the *Iberian* mountain system. Between this and the Alpine folds of the *Pyrenees* is the depression of the *Ebro basin*, which is practically shut off from the Mediterranean by the *Catalonian mountains*.

In the south-east are the Alpine folds of the *Sierra Nevada*. Between these and the Meseta is the depression of the *Guadalquivir* valley or *Andalusia*.

Climate.—The Atlantic littoral has a sufficiency of rainfall, which in the north-west is regular but which shows a winter maximum in the south-west. The Mediterranean coastlands are dry, with autumn and spring maxima. The Meseta is a region of scanty rainfall, and owing to its altitude it has considerable diurnal and annual temperature ranges.

Productions and Occupations

Farming.—The chief occupation of the peninsula is agriculture, but it is hampered by rather primitive methods.

In the well-watered western and north-western areas agriculture is possible wherever soil conditions are suitable, but in the drier areas of the east and south irrigation is necessary and the chief crops are produced on the irrigated *huertas*.

Cereals are distributed according to rainfall. *Maize* is grown in *Galicia*, but in all other areas *wheat* and *barley* are the chief grains. The chief wheat lands are in the upper Douro valley round *Valla-*

dolid, in the Ebro valley and in Andalusia. *Rice* is grown in irrigated areas in the east.

Olives, *grapes* and *oranges* are grown in many parts of the peninsula. *Olives* are grown principally in the Ebro valley, in Andalusia and in Southern Portugal.

Grapes are even more widespread. Wine is produced in three main areas. From the *Douro* valley comes the famous *port wine*, from the neighbourhood of *Jerez* comes *sherry*, and from the *Catalonian* coast and the *Ebro* valley come the wines of *Tarragona*. *Valencia* and *Murcia* are noted for the production of *dried fruits*, chiefly raisins and muscatels.

Oranges are mainly grown in the neighbourhood of *Seville*.

Pastoral occupations are of great importance in the north-west, where *cattle* are reared, and on the Meseta, where *sheep* and *goats* are reared. Owing to the dry summers it is necessary to practice *transhumance*, the sheep being moved into the mountain pastures during the summer months but being pastured on the plateau during the winter.

Mining and manufacture.

—The old rock areas of Spain include a considerable mineral wealth and mining is now an important occupation. *Coal* is mined principally in the north on the flanks of the Cantabrian Mountains near *Oviedo* and *Gijon*. There are smaller coal-fields on the flanks of the Sierra Morena in the south, near *Ciudad Real* and *Cordoba*.

The distribution of *iron* is similar. The principal mines are behind *Bilbao* and *Santander* in the north, but there is also some mining behind *Almeria* and near *Rio Tinto* in the Sierra Morena.

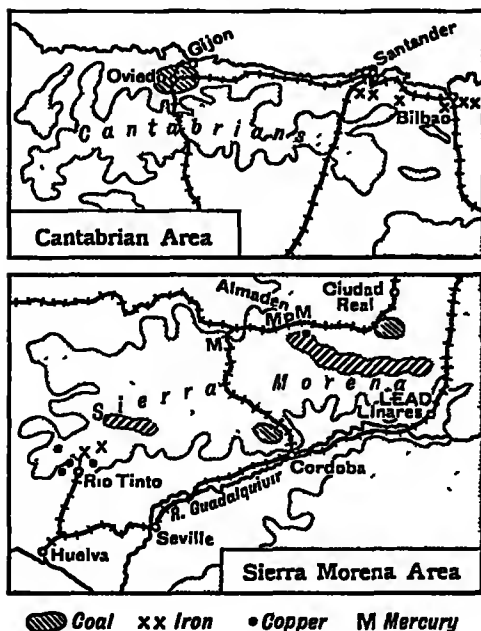


FIG. 142. SPANISH MINING AREAS.

Spain is an important European producer of copper, the output coming almost entirely from the pyrites of the *Río Tinto* district. *Lead* is mined near *Linares* in the Sierra Morena and mercury near *Almaden*.

Manufacture has not reached any advanced stage. On the northern coast the local iron ores lead to *iron and steel* works, some of the coal used coming from South Wales as a return cargo for the iron ore. Barcelona is the chief industrial centre. *Hydro-electric* power is utilized for *textile* industries using imported cotton, chemical and glass works.

Natural Regions and Towns

The natural regions are determined very much by build, and they have most distinctive features.

Portugal.—This independent country is on the west. It consists mainly of the lowlands to the west of the Meseta, but includes the western edge of the plateau. In the north the main district is the vine-growing area of the Douro valley, but in the south olives and wheat are the main crops. On the wetter slopes of the plateau *cork oaks* are grown and there is a considerable export of cork. *Pig* rearing has developed in the forested areas.

Lisbon, the capital, occupies a good position overlooking the estuary of the *Tagus*. It has good routes to the rest of the country and to Madrid via the Tagus valley. It is an important liner port for the South American route.

Oporto is the main town of the Douro area, and is noted for its wine trade. *Setubal* is the centre of a sardine fishing and canning industry.

Spain.—As a country Spain developed from the union of Castile and Aragon and made considerable progress during the sixteenth century, after having broken the Moorish domination in the fifteenth century. Soon after acquiring its vast South American empire it ceased to advance and has declined as a world power, while it has lagged behind Western Europe in the progress of the last century.

The Meseta forms the core of the country. It is a land of poor agriculture and pastoral occupations. *Madrid*, the capital, devel-

oped owing to its central position. As capital it has become the route centre, but it has few natural advantages.

Toledo in the Tagus valley, and *Badajoz* in the valley of the Guadiana, are the main towns of the south of the Meseta. *Valladolid* is the centre of a fertile region in the upper Douro valley, and *Burgos* controls a route on to the Meseta between the Cantabrians and the Iberian mountains.

Northern Spain, consisting of the old mountain area of Galicia and the Cantabrians, is important as containing most of the mineral wealth and the best watered part of the country. In the east of this area are the *Basque* provinces, the Basques being an old race with a language of their own. They are more active than their neighbours, and this partially accounts for the better development of these areas. The chief towns have been mentioned in connection with the mining. In the north-west *Corunna* and *Ferrol* are good ports in sunken valleys.

The Ebro valley is a region which is fertile owing to irrigation works. The main town is *Zaragoza* (Saragossa). It is in the centre of a fertile district and has a good route to France via *Jaca*, and to Madrid via the *Jalon* valley. *Lérida* is another irrigation centre. The *Pyrenees*, to the north, have little economic value at present, save as a tourist region, though water power potentialities are great.

Catalonia is the coastal district to the north of the mouth of the Ebro. The hills are forested, and the valleys are fertile and well irrigated. The Catalonians are the most energetic people of Spain, and *Barcelona*, the chief town and port of the district, is the largest town and chief industrial centre of the country. *Tarragona* is a wine centre.

The Mediterranean coastlands are comparatively narrow and are only important in regions of irrigation. They are important as wine and fruit producing centres, and these commodities are becoming more important among Spanish exports. *Valencia*, at the mouth of the *Guadalaviar*, is the centre of the largest and most fertile "huerta" area. Further south *Alicante*, *Murcia* and *Cartagena* are also centres of irrigation areas.

The *Sierra Nevada*, the Alpine fold area of the south-east, contains

many fertile valleys in which fruit growing is possible. The main centre is *Granada*, in the most fertile district, which is noted as being the main centre of the old Moorish civilization.

Andalusia, or the valley of the Guadalquivir, is a region of considerable fertility, but its rainfall is hardly sufficient for abundance. Where irrigation is practised, wheat, olives, oranges and grapes are grown. Cattle are reared on marshlands near the river.

Seville is the main centre of the region. It has a few industries, and a canal makes it the main port of the area. It exports some of the minerals of the Sierra Morena. *Jerez* is the wine centre, while *Cádiz*, which was a noted Phoenician port known as "Gades", is now unimportant compared with Seville. *Huelva* is the port for the Rio Tinto copper mines.

Gibraltar is a strongly fortified town on a rocky peninsula and is the British naval station guarding the entry into the Mediterranean by the Straits of Gibraltar.

EXERCISES ON CHAPTER XLV

1. What are the chief characteristics of a Mediterranean type of climate? Show how the plants of Mediterranean lands are suited to their environments. (S.L.C.)
2. Explain why true Mediterranean conditions in Spain are confined to a narrow strip of coast on the south and east. Write an account of (a) the methods of cultivation, and (b) the life of the inhabitants of this strip. (C.S.C.)
3. Where are the main lowlands of the Iberian peninsula? Take any two of them and write a comparative account of them under the headings (a) relief and climate, (b) occupations and productions.
4. Use the Iberian peninsula to show how physical features influence routes and town sites.
5. Describe the importance of (a) irrigation, (b) transhumance in the development of farming in Spain.

CHAPTER XLVI

ITALY

THE Italian peninsula is the largest portion of the modern State of Italy—modern because it only attained its unity in 1861, after having for centuries been divided between small kingdoms and city states or under foreign domination.

Build and Climate

Alpine folds.—Italy contains three distinctive structural areas. In the north are the southern and eastern valleys of the curving Alpine system. In Italy these have a steep slope. In the west, from *Lake Maggiore* to the *River Tanaro*, the *crystalline* core of the Alps abuts on to the adjoining plain. From Lake Maggiore eastwards the Italian Alps are of *limestone*. In the extreme east Italy includes a small portion of the limestone system that forms the *Dinaric Alps*. This is the *Karst* area at the base of the Istrian peninsula, important because it gives a general name (Karst) to a special type of limestone scenery (see p. 402).

The peninsula.—From the *Col Altare* behind Savona the *Apennines* stretch through the length of the peninsula, lying first on the west coast but crossing over to the east coast behind Ancona and then back to the west coast further south. They are mainly of *limestone* formation and the folds run diagonally across the main direction of the chain, this being especially marked in the north.

In the west, separated from the Apennines by the *Chiana depression*, is a separate upland area containing sedimentary hills, with a *volcanic* area in the south. The valleys of the *Arno* and the *Tiber* shut this region off from the Apennines and form routes of considerable importance.

In the south-east *Apulia* is a limestone plateau, while *Calabria*, the "toe" of Italy, is mainly a crystalline remnant of an old mass, of which *Sardinia* and *Corsica* also contain remnants. *Sicily* is a continuation of the Apennine system, with a volcanic area round *Etna*.

The peninsula thus contains few lowlands, the chief being those in the valley of the *Arno*, the *Campagna* of the *Tiber* valley, both of which are mainly alluvial and have only recently been fully reclaimed from marsh conditions, and the volcanic *Campania* of *Naples*.

Lombardy.—Lying in the hollow between Alps and Northern Apennines is the *Plain of Lombardy*, consisting of young *sedimentary* rocks, formed partially by uplift of the sea bed and partially by deposition of material brought down from the mountains.

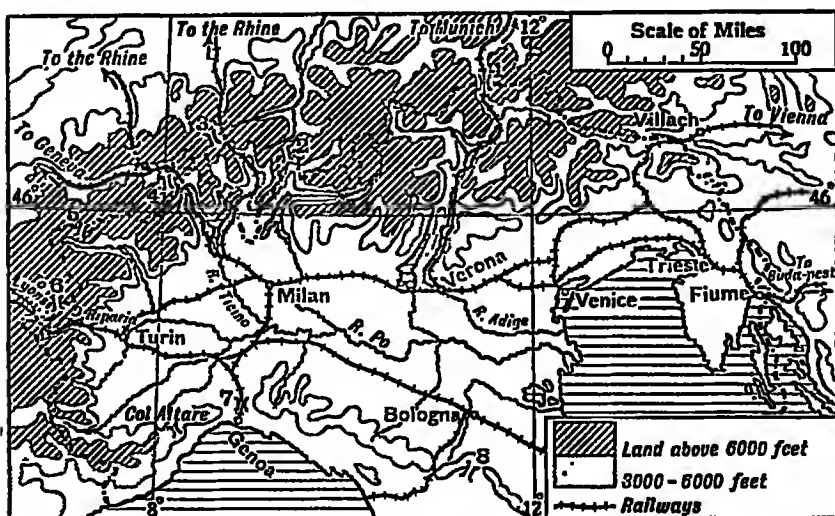


FIG. 143. THE POSITIONS OF THE TOWNS OF THE PLAIN OF LOMBARDY IN RELATION TO PASSES AND ROUTES.

Passes.

- | | |
|------------------|-----------------|
| 1. Brenner. | 5. St. Bernard. |
| 2. Splügen. | 6. Mt. Cenis. |
| 3. St. Gotthard. | 7. Bochetta. |
| 4. Simplon. | 8. La Futa. |

Note—(i) that all the old pass routes are not followed by railways;
 (ii) the direct route from Genoa to Central Europe.

The *Po* and the *Adige* are still building up this area. Like many other rivers in alluvial plains, the *Po* has built up its bed and is liable to flood, so that the banks have had to be built up and there are distinct *marsh* areas in the east and few settlements near the river itself. So shut in is this plain by the almost encircling mountains that the routes into it are controlled by the passes over the mountains. These passes and the towns connected with them are shown in Fig. 143.

Climate.—Peninsular Italy conforms to the general description of the Mediterranean climate already given. The plain of Lombardy, owing to the high mountains on the west and the fact that it is open to the east, shows two important variations from the climate of Mediterranean areas. It has a markedly cold winter, so that temperature ranges are high, and it has a good deal of rain in summer, so that its rainfall is practically evenly distributed throughout the year.

Occupations and Productions

Farming.—Containing fertile plains and enjoying a good climate Italy is essentially an agricultural country though industries have grown considerably since its unification. The main agricultural and industrial area is the plain of Lombardy, where irrigation is very important away from the marshy areas that require drainage. *Cereals* of all types are grown on the plain. *Wheat* is grown in all save the most marshy areas in Lombardy, in the lowland areas of the peninsula, and even on the less fertile upland areas. There has recently been a large increase in wheat growing in Italy, especially in the newly drained areas. From *Apulia* comes the *hard wheat* that is used for making macaroni.

Maize is grown particularly in the plain of Lombardy and, as "polenta", forms one of the main foods of the people of that area.

Italy is the only European country producing appreciable quantities of *rice*, this being grown in the irrigated areas of Lombardy. It is of high quality and there is considerable export which is balanced by an import of poorer qualities.

A great feature of Lombardy is the large production of *silk* based

on the *mulberry* trees which are grown in many places as supports for the vines. *Vines* are grown in most areas, but the most famous wines are the *Chianti* wines from the *Arno* area.

Olives and *fruits* are important in the lowlands of the peninsula, especially in the very fertile district of the *Campania* round Naples, *oranges* and *lemons* being grown in this and also in other sheltered southern districts.

Cattle are reared in large numbers on the plain of Lombardy and, as a result, the region is noted for its *Parmesan* and *Gorgonzola* cheeses. On the limestone areas of the peninsula *sheep* and *goats* are more important.

Mining and manufacture.—Mining is practically non-existent. There are small deposits of *iron ore* in some of the *Alpine valleys*, but the main iron mining region is the small island of *Elba*. *Sulphur* is obtained from the *Etna* district of Sicily. Small quantities of *lignite* are found near *Sicua*, while *Carrara*, to the north of Pisa, is noted for *marble*.

Despite the lack of minerals and coal Italy has developed considerably as a manufacturing country. This has been partly due to

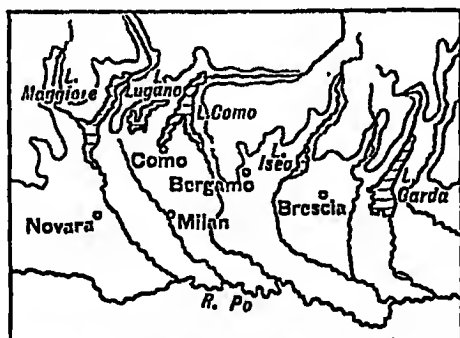


FIG. 144. THE ITALIAN LAKES AND THE TEXTILE MANUFACTURING CENTRES OF LOMBARDY.

encouragement of industries by means of tariffs. Great strides have been made since it has been possible to harness the many mountain streams to provide *electricity*. The chief industrial area is the plain

of Lombardy. Local silk gave some impetus to the *textile* industry, though Italy is a producer of raw silk rather than woven silk. The chief textiles manufactured are of *cotton*, raw materials being imported from U.S.A., India and Egypt. The towns connected with cotton and silk are mainly on the plain at the foot of the Alps, chief of them being *Milan, Como, Bergamo, Brescia* and *Novara*. The cold winters of the plain lead to the manufacture of *wool* at *Bergamo* and *Brescia*. There is also a considerable manufacture of artificial silk.

Iron and *steel* industries are based on imported materials, so that the chief centres are at *Genoa* and adjoining coastal districts. *Turin* is noted for its manufacture of motor cars.

Natural Regions and Towns

The structural regions form the main natural regions of the country.

The *Alpine* area is important for its routes, but has not a large population. In the valleys, which are sheltered by the mountains, there are vineyards, while the lakes, which are of glacial origin, are the main centre of attraction for a large tourist industry, and towns are mainly tourist centres.

In the east the ports of the *Karst* area on either side of the peninsula of *Istria, Trieste* and *Fiume*, are now diminished in importance as they grew up as the natural outlets of Austria and Hungary.

The *plain of Lombardy* has already been described as the most populous part of the country. It is mainly a region of intensive cultivation producing rich crops.

The tendency of the rivers to flood has caused the main towns to grow up away from their banks and they are situated where routes through the *Alpine* passes meet the routes skirting the highlands (see Fig. 143). Chief of these is *Milan*, controlling routes northward via the *Simplon, St. Gotthard* and *Splügen* passes, and now a big industrial centre. *Turin* is an industrial centre and controls the route to the *Rhône* by the *Dora Riparia* and *Mt. Cenis*. *Verona* controls the *Brenner* pass to Germany, and *Bologna* the route into the *Arno* valley. *Cremona* has a fairly central position in the plain.

Venice grew up at a defensive position among deltaic islands. It is thus handicapped as a modern port, and it is at a further disadvantage in being at that end of the plain which is not very industrialized. Its position at the head of the Adriatic is away from the main streams of Mediterranean commerce.

The peninsula, with its central mountain barrier of infertile hills, contains a series of isolated lowlands containing one or more towns.

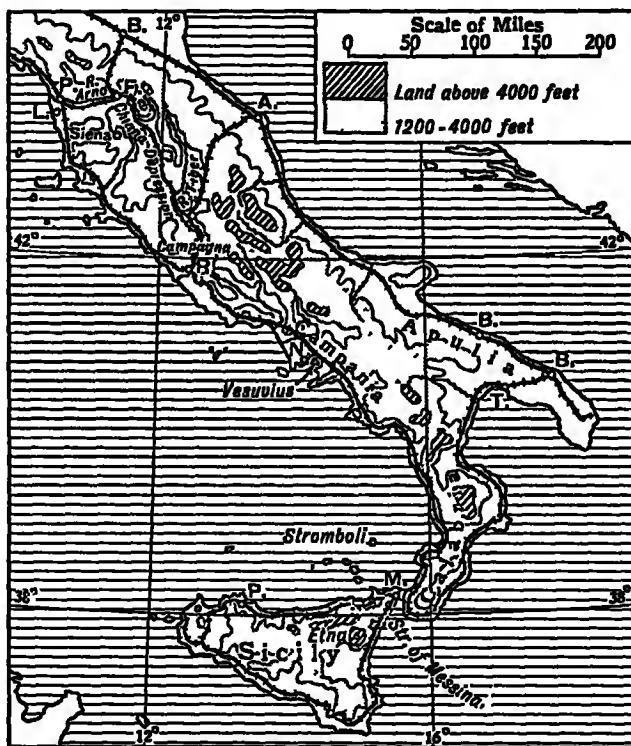


FIG. 145. PENINSULAR ITALY.

Identify the towns.

- Note—(i) diagonal folds;
 (ii) routes following the coasts;
 (iii) the importance of the Chiana depression as a route way.

The *Ligurian* coast along the Gulf of Genoa has practically no coastal plain and agriculture is carried on on the terraced hillside. *Genoa* is now the main port of Lombardy, to which it has access by the *Bochetta* pass. Its situation at the head of a gulf gives it a good natural position for a port. The Alpine passes give it a secondary hinterland which includes Switzerland and South Germany.

The *Arno valley* is a rich agricultural area containing many fine old cities. *Florence* is in the centre of the valley and controls the route into Lombardy and that southwards to Rome by the *Chiana* depression.

Pisa, the old port, has silted up and the modern port is *Leghorn*, though this is itself an old city.

The *Campagna* is dominated by *Rome*, which, growing up on volcanic hills above the plain and controlling the *Tiber* valley, once became the centre of a vast empire and, as the result of being made capital of the unified country in 1861, has grown to be the biggest town of the country.

The *Campania* of *Naples* is a very fertile region. The city is not only a big port, owing to its fine bay, but has developed industries based on imported cotton and hemp.

The *east coast* has steep-sloped hills and very narrow coastlands. These are irrigated and well cultivated, and *Ancona* is a good port at a point not far from where a railway crosses the Apennines to the *Tiber* valley. Further south *Apulia* is another highly irrigated area along the coast, with a limestone plateau in the interior. *Bari* and *Taranto*, at the bases of the *Otranto* peninsula, are the largest towns, and *Brindisi* is an important port for the rail and liner routes to the Near East.

Sicily produces wheat and fruit and supports a large population. The sheltered southern areas are noted for lemons. The main town is *Messina*, nearest to the mainland and commanding the Straits of *Messina*.

Sardinia (Italian) and *Corsica* (French) are both infertile and sparsely inhabited, for the uplands are of old hard rock, usually suitable only for poor pastoral occupations, while the lowlands are unhealthy. The district behind *Cagliari*, in *Sardinia*, is being drained. *Ajaccio*, the

capital of Corsica is the centre of the only populous area of any importance.

EXERCISES ON CHAPTER XLVI

1. Using the following headings write a short account of the plain of Lombardy: (a) physical features, (b) climate, (c) occupations of the people. (O.S.C.)

2. Discuss briefly the distribution of population on the northern shores of the Mediterranean, with special reference to geographical features. (O. and C.S.C.)

3. Select an important textile manufacturing area in Italy. Draw a sketch map of the region showing relief, rivers and towns; give an account of the textile industry under the headings (i) sources of raw materials, (ii) sources of power, (iii) transport facilities. (J.M.B.S.C.)

4. What is a hinterland? Show, by a sketch map, the hinterland of Genoa, and give some account of its trade. (L.S.C.)

CHAPTER XLVII

SOUTH-EASTERN EUROPE AND THE BALKAN PENINSULA

THE third peninsula of the Mediterranean is the Balkan peninsula. It is possible to consider this separately, but it is easier to understand when it is considered in relation to the adjoining lands. This is particularly so in the case of its structure.

Structure

A preliminary survey will show that this area has two outstanding structural features, the *Dinaric-Pindus* system which forms the western edge of the area and abuts on to the Adriatic, and the big double curve of the *Carpathian-Transylvanian-Balkan* mountain system that lies in the east. Crossing the area from north-west to

south-east is the *Danube*, flowing across lowlands enclosed by these ranges, while in the south they enclose a highland area known as the *Rhodope*.

Western folds.—The *Dinaric* system has a main north-west to south-east direction. It is made of *limestone* of a particularly *porous* nature and consequently water soaks through and gives rise to little surface drainage. Rivers flow underground or in deep gorges and are useless for navigation and of little value for irrigation. The absence of surface water makes the region difficult for habitation, as the surface is dry and barren. The limestone of the surface is broken up along the structure lines of the rock and movement across it is difficult. Such regions are known as *Karst* lands from the Carso or Karst area of the Istrian peninsula. The land rises steeply from the Adriatic coast, which is much broken up. Many islands running parallel to the coast have been formed from remnants of coastal ridges where the land has sunk.

The *Pindus* system continues the Dinaric region to the south of Lake *Scutari*, and has, in *Albania*, a small area of coastal plain. Otherwise the limestone mountains reach considerable heights and contain only small isolated areas of lowland. In the west the lowlands bordering the transverse *Gulf of Corinth* are important, but the largest are the plains of *Thessaly* and *Thebes* in the east.

Eastern folds.—The *Carpathians* are an eastward continuation of the Alps. The main eastern curve is of *sandstone* and similar young material and is not very high. In the north the inner portion of the curve contains a region of old hard rock forming the *Tatra* mountains, drained by the river *Hernad*, while south of this region are the volcanic *Hungarian* or *Slovakian ore* mountains.

In the south the Carpathians bend westward and form the *Transylvanian Alps*, which are largely of old hard rocks. In the angle between the two lies the highland area of *Transylvania*, mainly an upland of recent rocks drained by the *Maros*, but with old rocks in the *Bihar* district of the west, and volcanic rocks in the east. The river *Olt* cuts a valley southwards from this area to the lower Danube and forms an important routeway.

The *Balkan mountains* consist of limestone ranges running east to

west, the folds having swung round in a sharp curve with the Danube breaking through at the *Iron Gate*.

Upland areas.—*The Rhodope* is a plateau area which represents the remnants of an old rock region considerably cut up by faulting and erosion. It is drained by the *Struma* valley, but more important are the valleys of the *Vardar* and *Maritza* lying between it and the Dinaric and Balkan systems respectively. Both of these valleys play a dominating part in controlling the routes from the Danube plains southwards.

The Bohemian plateau has no structural connection with these regions but it is included here owing to the fact that it lies within the boundaries of Czecho-Slovakia. It is really a Hercynian remnant and its main drainage is to the North Sea, for it forms the upper basin of the river *Elbe*. It is rather like a kite in shape, with its main axis from north to south. Its edges are clearly marked and are largely due to faulting. In the north-west is the *Erzgebirge*, in the south-west the *Bohmer Wald*, in the north-east the *Riesengebirge* and the *Sudetes*, and in the south-east the *Moravian Hills*, which are the lowest of all. The rivers all drain to the Elbe, which leaves the plateau in the north after having flowed across a basin of fairly recent rocks.

The lowlands.—The *Danube*, which rises in the east of the *Black Forest*, flows eastwards to the south of the Swabian Jura and then turns south-east along the foot of the Bohmer Wald. Its right bank tributaries in this part of its course drain the northern slopes of the Alps. The upper courses of these—the *Inn*, the *Pinzgau* and the *Enns*—show clearly, by the direction of their valleys, the west to east structure lines of the Alps in this region.

South of the Bohemian plateau the river crosses the *Vienna basin*, which lies between the Alps and the Carpathians, and then, passing through the *Pressburg* gate, crosses the *Little Alföld*. Near Pressburg the river is joined by the *March*, which drains the lowland between Bohemia and the Carpathians and gives access to the Oder valley by the *Moravian* gate. The *Bakony Forest* range marks the southern limit of the Little Alföld and the Danube passes through this in a narrow valley above *Buda-Pest*. It then flows across the *Hungarian*

mountains, and, skirting the latter, has the plain of *Wallachia* on the left bank. It is turned north by the limestone plateau of the *Dobruja* before entering the Black Sea through a delta.

Fig. 146 shows the main structural areas of these regions and also the important routeways that are determined by the physical features.

Climate.—These lands are transitional between the Mediterranean lands and Eastern Europe. The coastlands of the Mediterranean have a typical winter rain climate, but its extent is limited by the configuration to very narrow coastal limits. The steep slopes of the Adriatic give rise to heavy rainfall at many points along that coast.

Once the mountain barrier is passed, continental conditions begin to assert themselves. Rainfall shows an increasing tendency to a summer maximum towards the east, while the cold winters give rise to large temperature ranges.

Race and History

The geography of this area is considerably influenced by the course of its history. From very early days it has been a meeting place of races. Its close proximity to Asia and the comparative ease of movement across the Eurasian land bridge has brought three races in contact here, the *Latin* races of the Mediterranean, the *Slavonic* races of Eastern Europe and the *Turkish* peoples from Asia Minor and Syria. Across it tides of conquest have ebbed and flowed, and political changes have been frequent. The Germanic domination of Austria spread southwards along the Danube and brought political unity to the centre of the area. The present century has seen the final break up of the Turkish Empire in Europe and the emergence of the independent states of the Balkans and the disintegration of the Habsburg empire of Austria-Hungary into its racial components. This latter break up has had important reactions, for the organization of the central area under this empire was reflected in its economic organization, so that the results of the changes have not been confined to politics.

If this brief survey is borne in mind it will make the more detailed study of the area more understandable. .

It will be more convenient to consider the development of each country in turn, as the very diverse racial and political elements make a unified study rather difficult.

The Balkan States

Greece.—Greece achieved independence early in last century, after hundreds of years of foreign domination. The modern State includes not only the peninsular areas and islands that formed ancient Greece but part of *Macedonia* (Rhodope area) as well. The islands and the many small plains of the peninsula produce *wheat*, *fruits* and *olives*. The chief product of the western areas is a small black grape which, when dried, forms the *currant* of commerce, the name coming from *Corinth*, the old centre of the industry. The chief town of the modern trade is *Patras* at the entrance to the Gulf of Corinth.

In the lowlands to the east and in Macedonia, *cotton* and *tobacco* are grown. These last two have been developed particularly since many Greeks, driven from the coastlands of Asia Minor by the victorious Turks in 1923, have settled in the region.

On the upland areas there are nomadic *shepherds*, but the interior regions are still comparatively backward.

There is very little mineral wealth though *lead* and *iron* ore are mined behind Athens.

The increase of population by the influx of refugees has stimulated manufactures. There are *cotton factories* at *Athens*. "Turkish" *tobacco* and *cigarettes* are made at *Salonika* and *Larissa*, while *wine*, *olive oil* and *soap* are manufactured in areas growing grapes and olives. *Athens*, the capital, lies in a small plain overlooking the Gulf of *Phaleron*, on which stands its port of *Piræus*.

Corinth is an old town on the isthmus, which is now crossed by a ship canal. *Larissa* is the chief town of the plain of Thessaly.

Salonika is a port occupying an important position at the southern end of the important route from the Danube basin via the *Vardar* valley, and serves Serbia as well as Macedonia. It is connected by railway to Athens.

disturbed past. It is developing slowly, mainly under the influence of Italy, which has now annexed the country. The people are primarily *pastoralists* but some *cereals* and *fruits* are grown.

Tirana, the capital, is centrally situated just on the inland edge of the main coastal plain. *Durazzo* is the port for the capital. *Scutari* stands on the plain surrounding Lake Scutari.

Bulgaria.—This Slavonic State only asserted its independence fully during the present century. It has suffered considerably by being on the defeated side both in the second Balkan War and the Great War. It stretches from the Danube to the Rhodope plateau and its only coastline is on the Black Sea. It contains two main areas of lowland, that lying between the Balkan mountains and the Danube, and *Eastern Rumelia*, between those mountains and the Rhodope.

Both of these lowlands, of which the former is more important, produce *cereals* and *sugar beet*. *Tobacco* is grown in the latter while *grapes* are grown in the regions near the Black Sea.

The *Balkan mountains* are *forested*, but the valleys are agricultural and in the *Tunja* valley are grown the roses from which *Attar of Roses* is made. The *Rhodope* is a region of primitive *pastoralists*.

Sofia, the capital, is at the point where the route from the Danube by the *Morava* valley, the *Dragoman* pass, *Maritza* valley and *Trajan's gate*, now used by the Orient Express, crosses the route over the Balkan mountains via the *Isker* valley. *Ruschuk* is a route town on the Danube, *Philippopolis* is an agricultural centre on the Maritza, while *Varna* and *Burgas* are the ports on the Black Sea.

Turkey in Europe.—This is now confined to a region with poor soil and a climate with temperature extremes and little rain lying between the *Istranja* mountains along the Black Sea coast and the lower *Maritza* valley.

Istanbul (Constantinople) is bound to be an important route town as it is where the north to south land route from Europe to Asia crosses the narrow sea passage between the Black Sea and the Mediterranean. It has declined in importance since the capital of Turkey was transferred to Angora.

EXERCISES ON CHAPTER XLVII

1. Describe the most important geographical features of Greece, and show how they have affected the mode of life of the inhabitants.
(O. and C.S.C.)
2. Show how the routes of the Balkan peninsula are controlled by the physical features.
3. What are the main exports of the Balkan peninsula? From what regions are the various products exported, and what are the geographical conditions that favour their production in the regions you mention?
4. What geographical factors prevented the ancient Greeks from becoming a united race, and what factors made them great colonists?

CHAPTER XLVIII

DANUBIAN STATES

Yugo-Slavia

YUGO-SLAVIA came into its present form as a separate political unit after the Great War, but it can scarcely yet be said to have achieved political unity. The diversity of its elements is shown by its original title—the Kingdom of the Serbs, Croats and Slovenes. It consists of *Serbia*, which is the chief area and is mainly the northern part of the *Rhodope* region, along with the old kingdom of *Montenegro* and various *Austrian provinces* of *Slavonic* origin which stretched from the Adriatic to the Danube, though, for strategic reasons a part of the Hungarian Alföld has been included in its boundaries.

Occupations and productions.—*Agriculture* is the main occupation of the country, but the variety of surface leads to a considerable diversity in farming.

The chief cereals are *wheat* and *maize*, and these are grown to the greatest extent in lowland areas adjoining the Danube and also in the valleys of the rivers that drain the plateau in Central Serbia and

to the east of the Dinaric system. In these valleys there is also an important production of *plums*, which, dried in the form of *prunes*, form an important export.

Sugar beet is grown in the Danubian area. *Grapes* are grown both in the sheltered valleys of the interior and along the Dalmatian coast. *Tobacco* is also grown in many regions. These products are used for local manufactures of *sugar*, *wine* and *cigarettes*.

Many of the highland areas are still forested and *timber* is the main export of the country, much being sent to Italy, which also is a market for many of the other products.

There are thought to be considerable mineral deposits, but so far they have been little developed. There are deposits of *lignite* to the south of *Belgrade* and in the region round *Laibach* in the upper Sava valley. *Iron* is found near *Sarajevo* in Bosnia, while *lead* and *zinc* are mined in the Alpine regions near *Laibach*.

Towns.—The capital is *Belgrade*, which commands the confluence of the Sava and the Danube. It is on the Orient Express route and controls the route south via the Morava valley. This route branches at *Nish*, one branch going south to the Vardar valley and the other south-east by the *Nishava* valley to Sofia and Istanbul.

Zagreb is where the route along the Sava is crossed by an east-west route from Buda-Pest to Fiume. Access from the main part of the country to its coastline is made difficult by the configuration, for the natural outlets are east via the Danube. The main *ports* are *Sushak*, which is on a fairly easy route and has grown because Fiume the neighbouring harbour is Italian, *Split* which is reached from the middle Sava valley, and *Ragusa*, which is accessible by a difficult route through Sarajevo.

Rumania

Rumania, the name of which suggests the descent from Roman settlers that is claimed by its inhabitants, has grown gradually since it began in 1859 from the union of *Wallachia*, the plain between the lower Danube and the Transylvanian Alps, and *Moldavia*, the region drained by the *Sereth* and *Pruth* rivers, which join the Danube just

above its delta. Much of the *Dobruja* was added after the Balkan wars; and after the Great War *Bessarabia*, between the *Pruth* and the *Dniester*, and the *Transylvanian* upland with a fringe of *Alföld* were added.

Occupations and productions.—Since the main part of the country is a fertile lowland Rumania is naturally an important agricultural country. In pre-War days it was one of the big *wheat* exporting countries, the grain being grown on large estates.

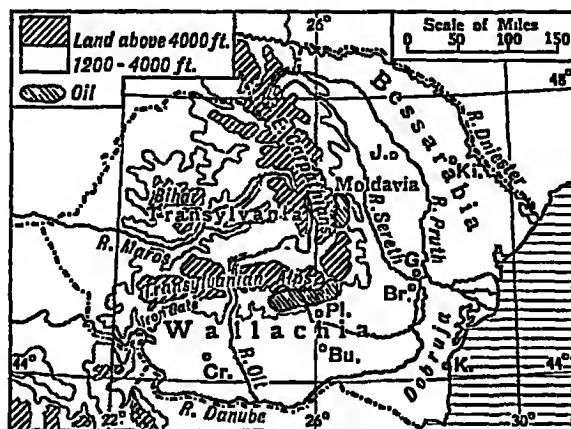


FIG. 148. RUMANIA.

Identify the towns.

Since the War the land has been divided up into small holdings and their peasant owners grow a much greater proportion of *maize* as they find it more generally useful. There is still a considerable export of both grains, the main ports being *Galatz* and *Braila*.

Sugar beet is grown in these lowlands and in Transylvania, in which region also *grapes* are grown and *wine* produced. *Tobacco* is cultivated in those portions of the *Alföld* plains that are included within Rumania.

The Carpathian area that is drained by the *Sereth* and its tributaries contains large *forests* and *lumbering* is important.

Sheep are reared in these regions and Transylvania, being moved to upland pastures in summer. The limestone *Dobruja* is also a

sheep rearing area. Transylvania has important mineral deposits. *Gold* is mined in the *Bihar* massif and *coal* and *iron* in the west of the *Transylvanian mountains*.

The most important mineral production of the country is *oil*. This is found on the flanks of the Transylvanian and Carpathian folds. The chief centre of oil refining is *Ploesci*, oil being sent by pipe-line to *Kustenje* on the Black Sea. *Salt* is also found in these foothill regions.

Towns.—*Bucharest*, the capital, is centrally situated on the Walachian plain and has grown important as the capital city.

Craiova is an important market centre to the west of the plain.

Jassy is the chief town in the valley of the Pruth and *Kishinev* is the main centre for Bessarabia.

Kustenje, which is connected by rail to Bucharest by means of a bridge over the Danube at *Chernavada*, is becoming the main port of the country.

Hungary

The Hungarians or *Magyars* are people of Asiatic origin who conquered the middle plain of the Danube before the Norman Conquest. Hungary is a small State lying in the middle Danube area, the boundaries of which have recently been extended by the incorporation of Ruthenia and parts of Slovakia. It is mainly a lowland, but between the Great and Little Alföld regions is a line of hills consisting of the Bakony Forest hills on the west and the outliers of the Hungarian ore mountains on the east.

Occupations and productions.—*Agriculture* is the main occupation, large crops of *wheat* and *maize* being grown on the lowlands. There is a considerable export of grain. *Sugar beet* and *fodder crops* are also of importance. In the hill regions *grapes* are grown.

The original Magyars were *nomadic* herdsmen who pastured their cattle on the grassland *Puszta*s of the Alföld and, though the nomadic life has ended, *cattle rearing* is still important. The growth of maize and fodder crops is leading to the development of *dairy farming*. There is little mineral wealth. *Coal* is mined near *Pecs* in the south-west and *lignite* at *Salgotarjan* in the Sajo valley.

Towns.—*Buda-Pest*, the capital, is a dual town. Buda, the old settlement, is built on high ground controlling the north-south routeway through the central line of hills, and Pest is a more modern city on the opposite bank. *Debreczin* and *Szegedin* are market centres in the Theiss valley.

All these towns have such industries as *flour-milling*, *tanning*, *brewing* and *sugar-refining* in connection with the agricultural productions. *Textiles* are made at Buda-Pest, imported cotton being used.

There is a good railway system focussing on Buda-Pest, but the country has no sea coast, much trade following the Danube.

Austria

Austria is the old *Germanic* core of the Austro-Hungarian empire, and at the end of the Great War the component parts of the empire were lopped off to form the independent States frequently known as the "succession States"—Czecho-Slovakia, Jugo-Slavia and Hungary. It has now become a part of the German Reich.

Structurally it consists of the eastern end of the *Alpine area*, with part of the *upper Danube* valley to the north and the *Vienna plain* to the east.

Occupations and productions.—The Alpine area, containing limestone areas in both north and south, is well known as a *tourist* centre, this being particularly so in the north, which is drained by the *Inn* and *Enns* and contains such well-known centres as *Innsbruck* and *Salzburg*.

Agriculturally the country is not well developed. There is considerable cultivation in the Vienna plain and in the Alpine foreland to the south of the Danube, *maize* and *wheat* being important in the former area, *grapes* in the latter. The Alpine regions have a typical *cattle* farming and *dairy* industry, making use of the summer pastures, with cultivation in the valleys. The country is unable to grow sufficient foodstuffs.

There is considerable mineral wealth. *Salt* is mined at *Hallein*, near Salzburg. *Iron ore* is mined in *Styria* and *lignite* near-by in the *Murz* valley, there leading to an iron industry at *Leoben* and *Graz*.

The *timber* resources of the Alpine region are important. *Paper* industries are developing there based upon the water power available, which also leads to textile manufactures in the *Vorarlberg* district adjoining Switzerland, from which they have spread.

Towns.—*Vienna* grew to be a big city as the capital of a large empire, and now it is too big for such a small country to support.

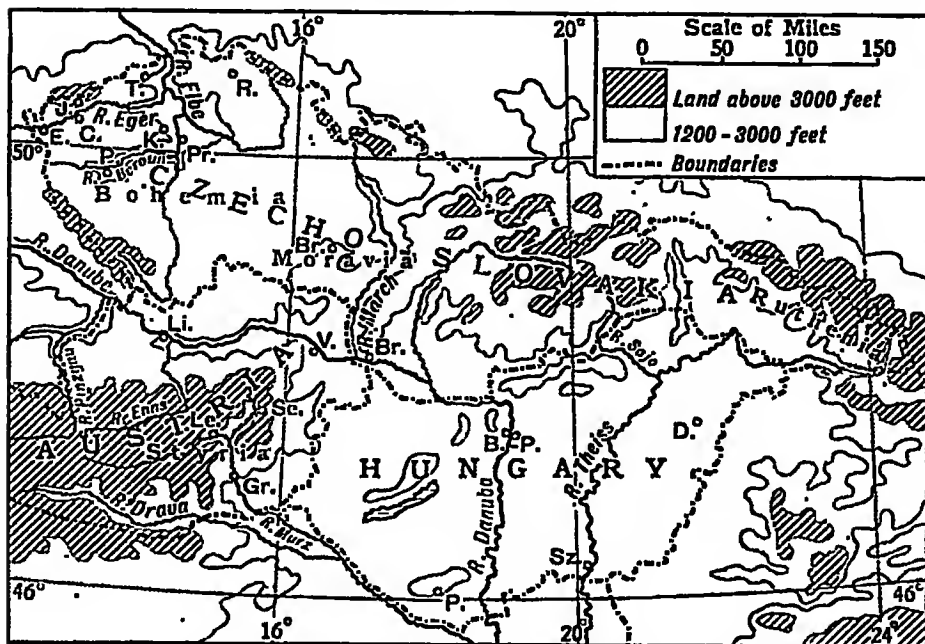


FIG. 149. CZECHO-SLOVAKIA AND THE MIDDLE DANUBE.

Identify the towns and the main mountain systems.

Note how the boundaries ignore physical features and lie across routeways.

It occupies a natural route position in the Vienna plain. It controls the route along the Danube leading from Germany and North-West Europe into the Danube basin and so to the east. The valley of the March leads to the *Moravian* gate, which gives access to the Oder valley and Poland. The route to the Adriatic and Italy is via the *Semmering* pass, the Murz valley, the Drava valley, and *Villach*.

The only other towns are comparatively small. Apart from those

already mentioned the chief is *Linz*, the main town in the Danube valley above Vienna.

Czecho-Slovakia*

This post-War State was made by uniting three old Austrian provinces—*Bohemia*, *Moravia* and *Ruthenia*—which were all inhabited by people of similar Slavonic origin, though it included also a large number of Germans in Bohemia. Structurally it includes the *plateau of Bohemia*, the western slopes of the *northern* and *central Carpathians*, with the intervening valley of the March forming the *lowlands of Moravia*. These regions occupy a central position in Europe and form a link between west and east, for while Bohemia is a region of advanced development, the Carpathian areas are characterized by peasant agriculture.

Occupations and productions.—*Agriculture* occupies a relatively more important position in the east than in the west, but the western agricultural area, being better developed, is really the more important.

Wheat and *maize* are the main cereal crops and they are grown particularly in the lowland basins of Bohemia and in Moravia. In both these areas *sugar beet* forms an important cash crop, Czecho-Slovakia being the second largest producer of sugar in Europe.

Potatoes are grown as a food and also as a raw material for manufacture, so that the country imports some foodstuffs to balance the growing of these cash crops.

Grapes are grown in the south of Moravia and in some of the Carpathian valleys. In certain parts of Bohemia, particularly in the neighbourhood of *Pilsen* and in the *Eger* district, the soil is very suitable for *hop* growing. In these regions barley is the main grain crop, the two leading to big *brewing* industries, particularly at Pilsen.

Cattle are reared in considerable numbers, the well-developed mixed farming providing plenty of *fodder crops* so that *dairy farming* is important, especially near the industrial regions of the west.

* This State has recently suffered disruption. Bohemia, Moravia and Slovakia have largely been incorporated in the German Reich, either completely or as "protectorates", while Ruthenia and parts of Slovakia have been incorporated with Hungary.

Forestry is important in some of the mountain regions, especially in the *Bohmer Wald* and in the Carpathian regions.

Mining and manufacture.—The country is rich in *minerals* and this has led to the development of industries. The main *coalfields* are associated with the Hercynian region. The chief fields lie in the valley of the Beroun, the main mining centres being *Pilsen* and *Kladno*. In Moravia it is mined to the west of *Brünn*, and on the boundaries of Poland, where there is a continuation of the Silesian coalfield.

Lignite is mined near *Teplitz* in Bohemia, near *Brünn* and in the *Sajo valley* in the Carpathians.

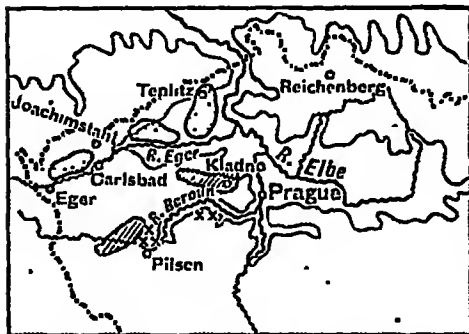


FIG. 150. THE INDUSTRIAL CENTRES OF BOHEMIA.

Iron ore is found near *Pilsen* and in the *Hungarian ore mountains*. These latter mountains also contain deposits of *lead* and *zinc*, while the *Erzgebirge* have some minerals, most notable of which is now *radium* from *Joachimstahl*.

Coal and minerals with raw materials locally available have led to many industries, Bohemia and Moravia having been the

main industrial areas of Austria-Hungary. *Pilsen* and *Prague* have important *iron and steel* industries based on local supplies of coal and iron. *Textile* industries are found at *Reichenberg*, where they are comparable with similar industries in the adjoining parts of Germany, at *Brünn*, a wool manufacturing centre, and in the Silesian district.

Glass is made at *Eger*, and *Carlsbad*, a spa, also has *porcelain* industries.

Agriculture and forest industries give rise to manufactures of *sugar*, *leather* and *paper*, particularly at *Prague*, though the famous Bata shoe works are at *Zlin*, near *Brünn*.

Towns.—*Prague (Praha)*, the capital, occupies a good route position in the centre of the chief lowland region of Bohemia. It has grown important as capital and as a big manufacturing centre.

Brünn occupies a central position in the Moravian area. *Pressburg* (*Bratislava*) controls the confluence of the March and Danube and so occupies an important route position on the route to Vienna through the Moravian gate.

The country has been hampered by the fact that its communications were planned to focus on Vienna or Buda-Pest, so that through routes have proved difficult, though they are gradually being improved.

Much of the trade of the country follows the natural route presented by the Elbe valley, and so uses German ports.

EXERCISES ON CHAPTER XLVIII

1. Write an explanatory account of the natural and agricultural resources of Czecho-Slovakia. (C.S.C.)
2. Write a geographical description of the basin of the Danube, with special reference to the chief physical regions of the basin; and the economic activities of the people in each physical region. (S.L.C.)
3. What are the principal exports of Rumania? What geographical factors have led to the development of these exports? Give the main production centres of each export you mention.
4. What are the reasons that caused Vienna to be described as "a capital that is too large for its state"? Give an account of the natural resources of Austria.

EUROPE: GENERAL REVISION

1. Locate three prominent areas of lowland in Europe—other than the Great European Plain. Select one of them and give an account of its climate, vegetation and occupations. (L.G.S.)
2. Describe and account for the characteristic features of the scenery of (a) the coast of Norway, (b) the coast of Holland. (O.S.C.)
3. Select one important coalfield in the continent of Europe. State its position and account for the industries that have developed upon it. (S.L.C.)
4. How do Eastern and Western Europe differ as regards relief, climate and access to the sea? Show that the different ways in which civilization has developed in the two areas have been influenced by these geographical conditions. (S.L.C.)

5. Discuss the natural advantages which have been responsible for the development of two of the following : the Saar area, the Zuider Zee region, the Po basin, the Lens area. (O. and C.S.C.)

6. What do you understand by a natural region? In the light of what you say consider the claim of one of the following to be regarded as a natural region : the Paris basin, the rift valley of the Rhine, the plains of Northern Italy. (S.L.C.)

7. Show how the characteristic occupations are related to geographical conditions in two of the following areas : Norway, the plains of Poland, the Dutch polders, the central plateau of France. (C.S.C.)

8. Give *one* area in Europe which supports a dense population and one area where there are few people. Why is the one densely peopled and the other sparsely peopled? (O.S.C.)

9. Select two of the following areas, describe their position, and give some geographical reasons for the activities that are carried on in them : (a) the Ruhr valley, (b) the Russian steppes, (c) Brittany, (d) the Riviera. (C.W.B.S.C.)

10. Select an important railway route from Paris to Constantinople, and show how its course has been controlled by the physical geography of the regions through which it passes. (S.L.C.)

11. Locate three important plateau areas in Europe. Select one of them and describe its climate, vegetation and occupations. (L.G.S.)

12. Locate (a) two areas of textile manufacture, (b) two areas of steel manufacture, in Europe. In each case give the reasons for the development of the industry in the region you mention.

CHAPTER XLIX

THE BRITISH ISLES: GENERAL OUTLINES

THESE have been left as a final study, partly because they form the home country, and partly because they can be used as a good example of a more detailed regional study.

Position

The British Isles are a group of islands lying off the north-west coast of Europe, stretching roughly from 50° to 60° N., and, with the Greenwich meridian of 0° crossing the eastern part of the island, lying between 2° E. and 10° W. approximately.

The entire island group is situated on the *continental shelf*, which is very broad off this point of Europe, and there are many evidences that at one time south-eastern England was joined to the continent.

Their position, which brings them in the centre of the *cyclonic influences* of the west wind region, has many important influences upon their development, which may be summarized briefly.

Effects of position on climate.—Temperature is kept moderate throughout the year, for the prevalent west winds give the islands a constant oceanic influence. Since the ocean is comparatively warm in winter and cool in summer, the temperatures are similarly modified. The British Isles lie in the *winter Gulf of Warmth* which bathes the shores of north-western Europe.

Rainfall is never deficient, for the westerly winds with their cyclones bring a regular supply, and this is well distributed, though physical features lead to heavier rain on the west.

General effects of position.—The continental shelf gives rise to shallow waters all round the coast—*i.e.* waters not exceeding 100 fathoms in depth. This has two marked effects. The tidal wave is accentuated by these shallow waters and so *high tidal rises*

are common along British coasts, this having a two-fold influence, in keeping harbours clear of silt and in enabling vessels to sail considerable distances up river estuaries.

The *shallow waters* of the continental shelf give rise to a big *fishing industry*, and this in its turn has been of considerable value in Britain's development as a maritime nation.

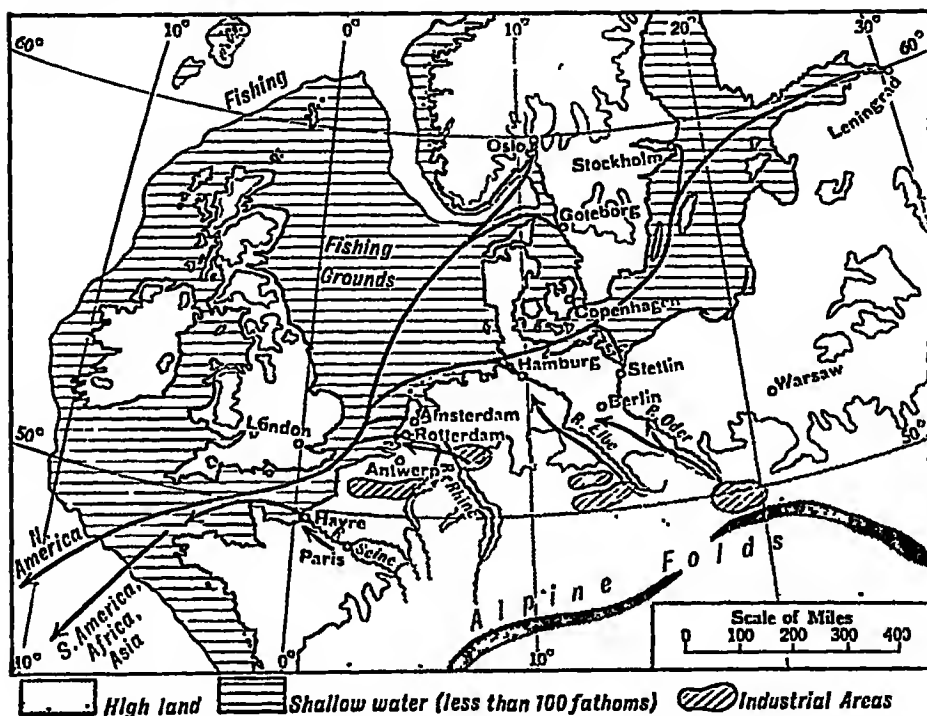


FIG. 151. THE POSITION OF THE BRITISH ISLES.

Note their position in relation to the industrial areas and the chief centres of northern and western Europe.

The islands lie opposite to the mouth of the Rhine, and athwart the entrances to the North and Baltic Seas. In the early days of European development, when trade and civilization were centred largely round the Mediterranean, this position was out of the way, but with the rise of the north European nations, the development of the industrial areas of north-western Europe, the discovery and development of the New World and the consequent development

of transatlantic trade and commerce, this position has become of great importance, for the islands lie at the focus of most of the world's great trade routes.

The importance of this isolated island position in political history must not be overlooked. For long it has given the islands practical immunity from attack, and they have been able to work out a political and economic system without disturbance.

Physical Features

The British Isles are easily divisible into two main physical regions. If a line is drawn from the mouth of the *Tees* in the north-east of England to the mouth of the *Exe* in the south-west, it will form a good dividing line, for all the land to the south and east of it is predominately *low*, consisting of recent *sedimentary* rocks, and the land on the north and west is mainly *highland*, most of it consisting of older and more *resistant* rocks.

The oldest, hardest and, therefore, highest area, is found in the north-west in the *Highlands of Scotland*, and the rocks become successively younger in a south-easterly direction. A study of the geological map (Fig. 153) will show that the main *structure* lines run from north-east to south-west, save in the south. Here there is another region of older rock, which is the western extremity of the *Hercynian system* of central Europe, and this runs in an *east to west* direction through south-western Ireland and the south-western peninsula of England.

It should be noted that the western edge of the lowland area of England is nearly marked by a line of limestone which runs south-westwards from the Cleveland Hills, just south of the Tees. To the west of this, and lying between it and the main highland region of England and Wales, lies a plain mainly consisting of new red sandstone.

Briefly then, the main structural areas are as follows.

In Scotland there are three main regions, the *Highlands*, a dissected plateau of old hard rocks cut in half by the rift valley of Glen More, the *Southern Uplands*, another dissected plateau but of less resistant material than the Highlands, and the *Central Rift valley*, between these two regions.

Wales consists almost entirely of a dissected plateau of rocks similar in age to the Southern Uplands of Scotland with old uplands associated with the Hercynian system in the south.

The highland areas of England are in two regions. In the north is the *Pennine upfold*, now worn down to form a low plateau lying in the centre of the northern part of the region. Attached to this, to the west, is the dome-shaped area of resistant rock that forms the *Lake District* or *Cumbria*. In the *south-west* are the remnants of the old Hercynian system, with intrusive granite left standing up to form the high land.

The south-eastern half of the country consists of sedimentary rocks which have been sufficiently disturbed to cause the various strata to outcrop along definite lines. The harder layers, consisting of limestone and chalk, form ridges of low hills, which usually have a steep *scarp slope* on one side formed by the broken edge of the strata and a gentler *dip slope* on the other side formed by the surface of the strata.

Ireland has its main highlands round the coast, while its centre is a plain.

Except for an area to the south of the Thames, the whole of the region has been *glaciated*. One of the most important effects of this has been the deposition in the lowlands of glacial drifts which cover the rocks from which the country was originally formed.

Climate

The British Isles, taken as a whole, belong to the cool temperate western margin of Europe, and the dominating factors in their climate are the three pressure systems which were noted in connection with Europe, viz. the Azorean high, the Icelandic low, and the varying continental region, giving rise to the south-westerly air currents in winter and north-westerly currents in summer. During winter the main factor is the constant procession of cyclonic disturbances, for two-thirds of the annual cyclones occur during the period from November to February.

Temperature.—Throughout the year the climate is mild, but it is possible to mark distinctive local conditions. In the *winter* the

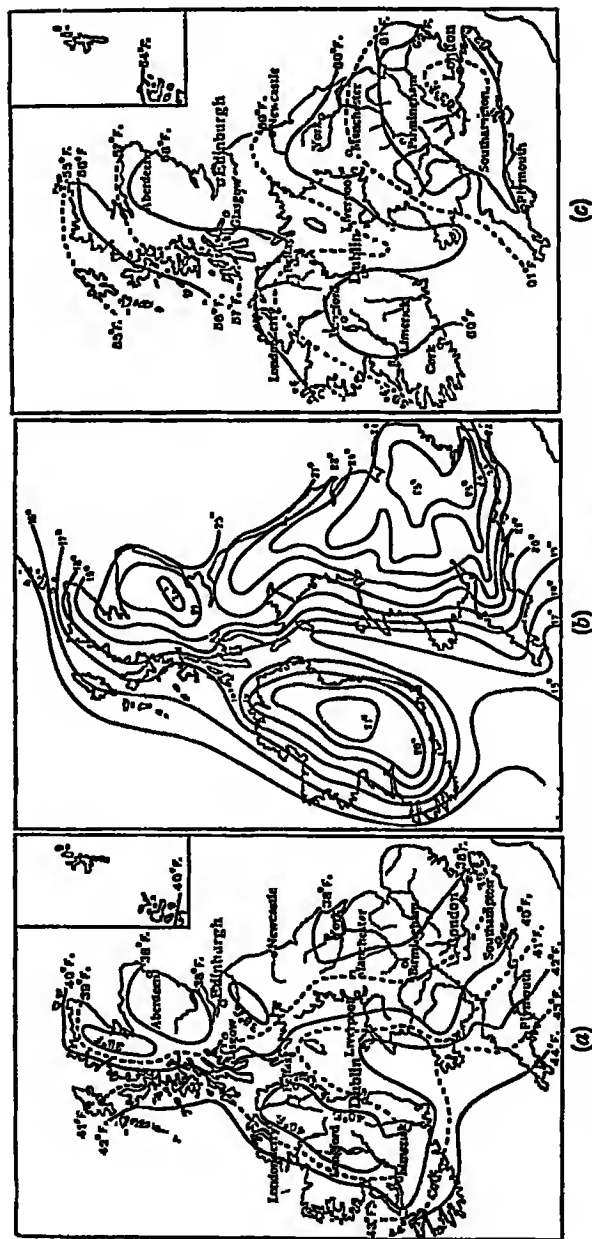
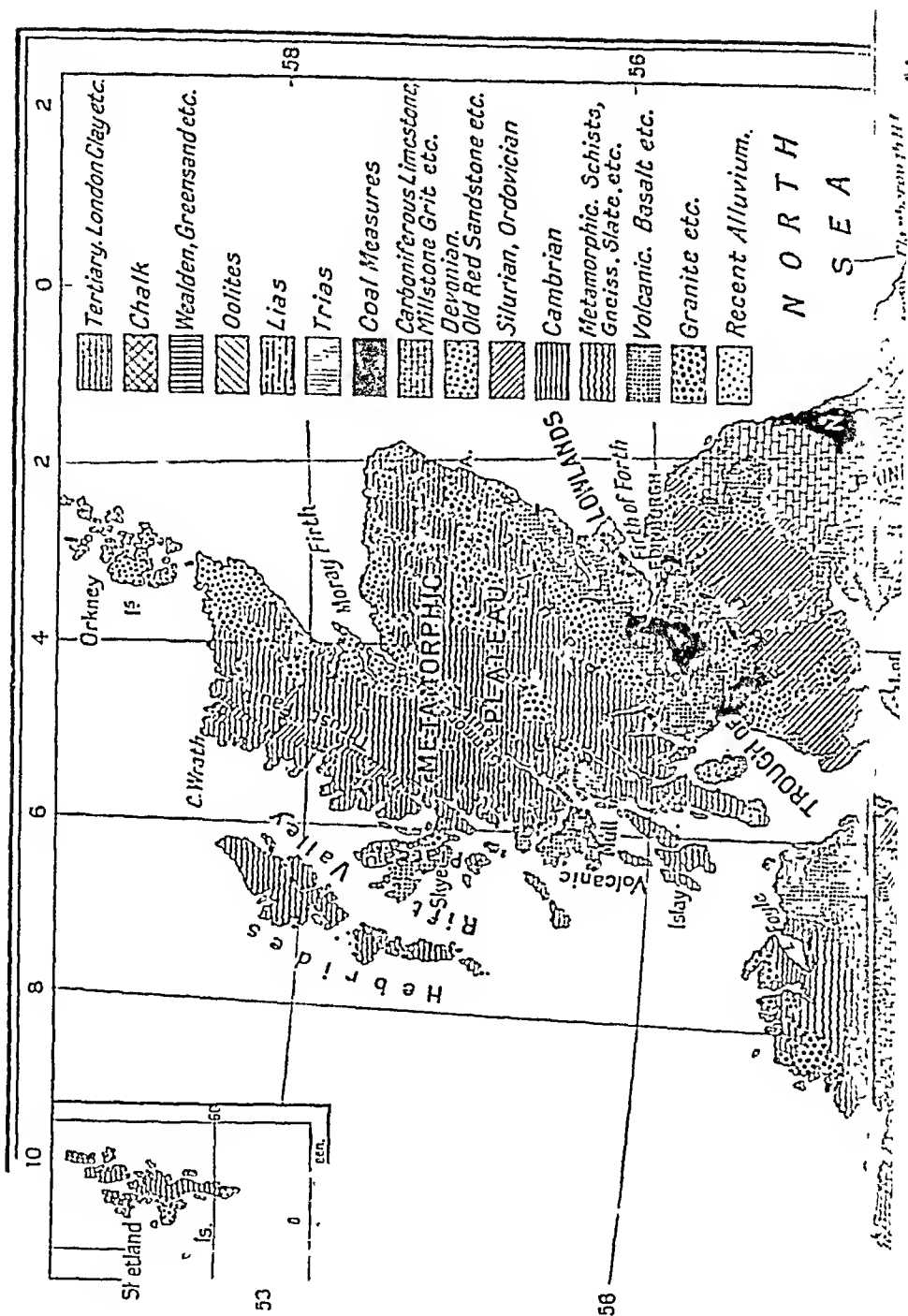


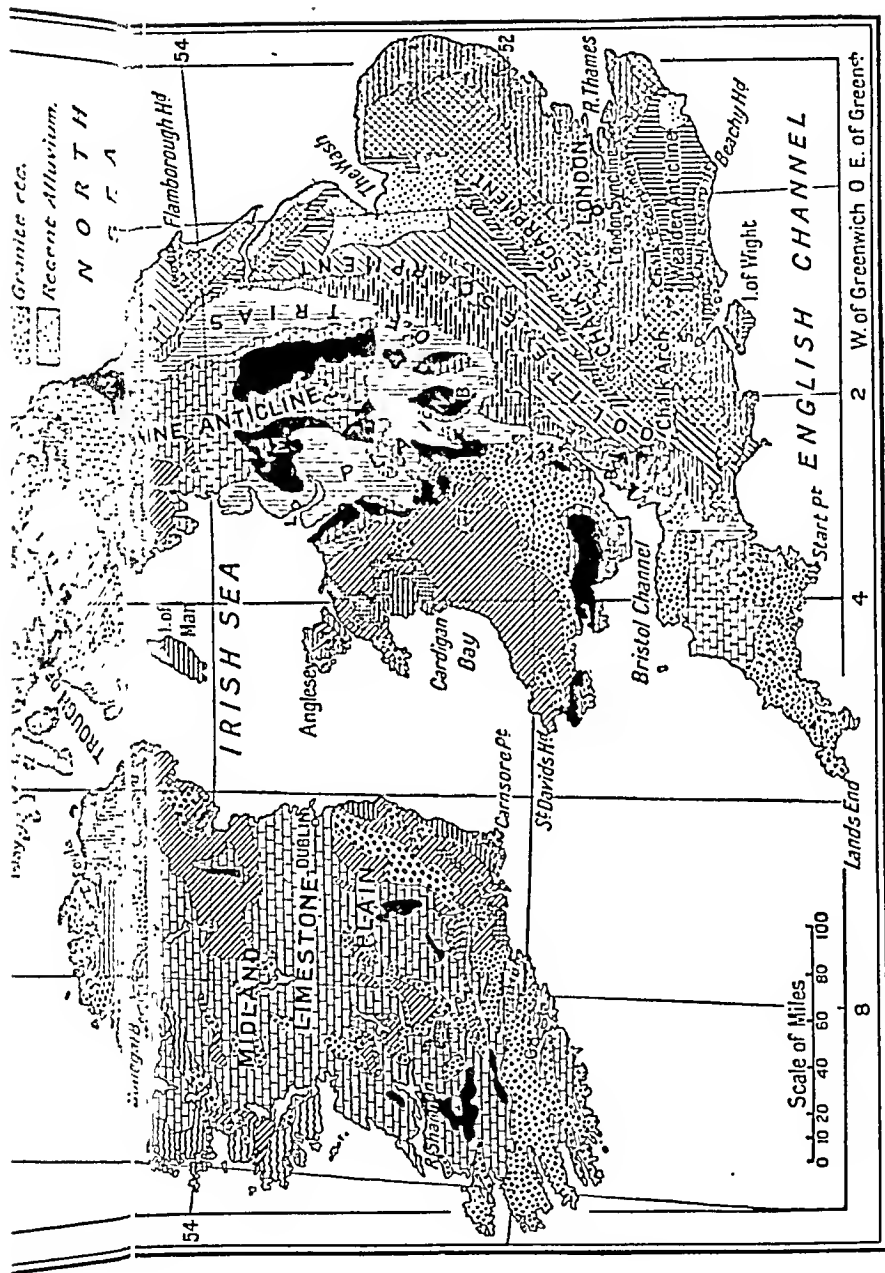
FIG. 152. TEMPERATURE MAPS OF BRITISH ISLES.

(a) January Isotherms.

(b) Average Annual Range of Average Daily Temperature (after Dickson).

(c) July Isotherms.





From Taylor's "Wonders of the Earth's Crust" by permission of Sir Isaac Pitman & Sons, Ltd.

FIG. 153. THE GEOLOGY OF THE BRITISH ISLES.

Atlantic is the main source of warmth, for the sun's rays are then at a low altitude and days are short—some eight hours in the south of England and six hours in the north of Scotland. *Isotherms* run from *north to south*, with decided curves to show the influence of the Irish Sea. Temperatures thus decrease from west to east (Cornwall 44° F., Cambridge 38° F.) while the control of the sea is shown by the fact that the Orkney Islands, to the north of Scotland, are then warmer than Cambridge.

In *summer* temperature decreases from south to north, with the *isotherms* showing a tendency to run from *south-west to north-east*, owing to the modifying influence of the sea in the west (London 64° F., Tweed basin 59° F., North Scotland 55° F.).

Rainfall is heaviest on the west coast and decreases towards the east. This is due to the combined influence of physical features and proximity to the main source of moisture.

There are regions of very *heavy rainfall* in the high land of the west, *Snowdonia* having some 200 in. per annum, the *Lake District* 140 in. and *Ben Nevis* 170 in., and there is a large area in North Scotland with over 80 in. (*i.e.* the same as the Amazon basin !)

The *lowest rainfall* is found on the lowlands in the east, and even here relief is important, for while the hill ridges have over 30 in. a year, the plains have between 25 in. and 30 in., while the *Fens* (round the Wash) and the lower valleys of the Yorkshire Ouse, Trent, and Thames have below 25 in.

Rainfall regions.—There is also, despite the comparative smallness of the region, a perceptible difference in seasons of rainfall.

The *western coastlands* have a typical oceanic climate, with a *winter maximum* of rain when cyclonic influence is most marked

The *midland* areas have *two rainfall maxima*. One occurs in late summer, when winds can penetrate easily, and one about October, when the sea is warm compared with the land, so that condensation takes place along with increased cyclonic activity. After October lower temperatures cause an increase of pressure over these regions and so mitigate the increased cyclonic activity.

The *east coast* tends to have a *continental* regime, and has its maximum in July.

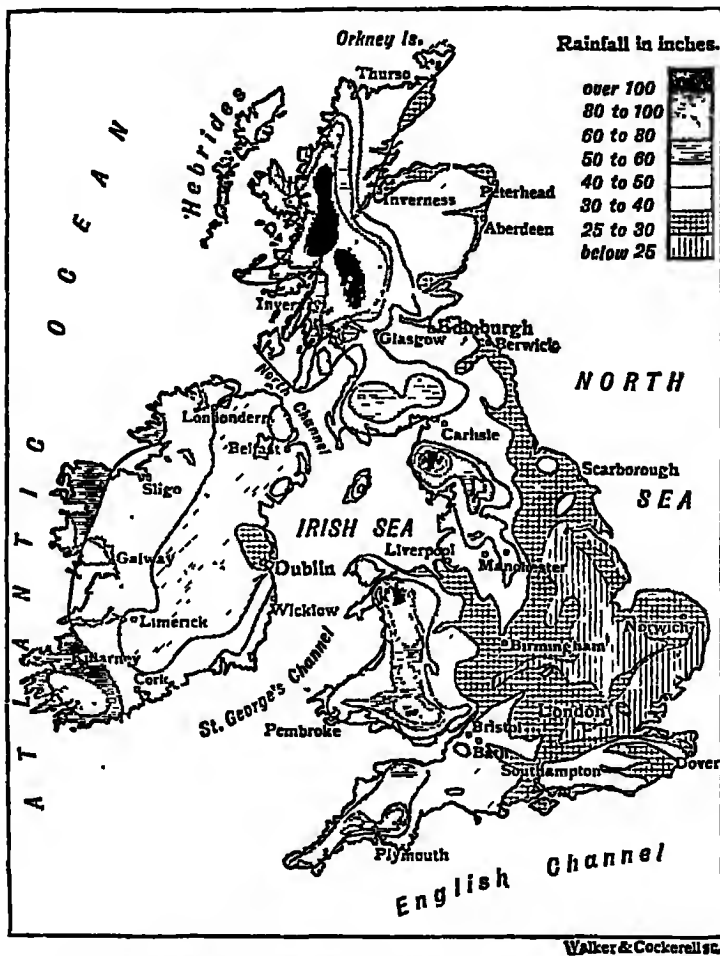


FIG. 154. AVERAGE ANNUAL RAINFALL OF BRITISH ISLES.

It should be noted that in all parts *spring is the driest period*, for then the sea is coolest compared with the land, and further, anti-cyclonic conditions are frequent.

Development

Before considering the various regions in detail, a brief summary indicating the general development may well be given.

It should be remembered that under natural conditions much of England was forested, the forests having been cleared over many centuries, and now much of the land is utilized. In the highland districts, however, there is still much waste land, and along the edges of the used land there is often a marginal area which is only used at times when economic conditions make it worth while.

Some knowledge of English history is essential if the present conditions are to be fully understood. This will be assumed. The essential points to remember are the changes that took place with the development of machinery. Before that time the population had been mainly concentrated in the lowlands of the south and south-east, afterwards it shifted northwards and westwards to the coal-fields on the edge of the high ground, while modern times are witnessing a reversal of this process.

Farming.—Although the chief farming areas are in the south and east, agriculture was for centuries the main occupation of the country. A long period of development led to the evolution of a well-designed *rotation system* which gives the land time to recuperate and provides the farmer with a balanced series of production. The rotation varies with the different regions.

The actual farming is considerably controlled by three factors: *soil*, *climate*, and type of *market* available.

Broadly speaking, *cereal* growing is most important in the drier eastern regions, where *wheat* and *barley* are the main crops. In the wetter west and in the cooler north *oats* are more important. These crops are grown in conjunction with *root crops* which form the basis of an important animal husbandry, important both for animal products and for the essential part played by animals in providing the manure needed in agriculture. *Cattle rearing* is more important in the wetter areas and so is carried on in the river lowlands and the western plains. Those areas near to big towns now specialize in

milk production; those more remote either in the production of cheese and butter or of beef.

Sheep are reared on the well-drained hill slopes of the west and on the more porous and therefore drier soil areas of the lowlands. At one time England was an important producer of wool for the weaving industries of the Continent, but nowadays, although the wool clip is important, the main concentration is on mutton production.

Fruit growing is carried on in various scattered areas, but mainly in specially favoured areas of the south where soil and climatic conditions are good.

In those regions in close proximity to or within easy access by rail and road of the large centres of population the growing of *vegetables* has become important. Mainly this has taken the form of "market gardening", with small units each producing a succession of vegetables, fruits and flowers throughout the year. Recently there has been a tendency, particularly in eastern England, for a specialized large scale production of vegetables and fruit which is more akin to the American "truck farming".

A modern development is the growing of *sugar beet* as a cash crop and not as a root crop incidental to animal farming.

Mining.—This is largely confined to *coal mining*. It is carried on almost entirely on the edges of the highlands which form the Penines, Wales and southern Scotland, with isolated regions where the coal measures have outcropped through the younger rocks adjoining these regions. The only producing region in the south-eastern portion is in Kent, where shafts have been sunk through the younger sedimentary rocks to reach the coal seams in the older rocks that lie below. This coalfield, and those near Bristol and in south Wales, can be regarded as belonging to the series found on the borders of the Hercynian system of central Europe.

Apart from coal, the next most important mineral is *iron*. This is found in some places in conjunction with the coal measures, while the other chief regions are found along the limestone ridge that stretches from the Cleveland Hills to the Cotswolds.

Salt is found in pockets under the sandstones that lie between the

limestone ridge and the highlands, principally in Cheshire and in the Tees valley.

The *tin* deposits of Cornwall are now almost worked out, and the lead production of the Pennines is not of great importance. *Slates* and *building stones* are quarried from the highland regions, and the chalk and limestone ridges provide the raw materials for important *cement* industries.

Manufacturing.—Since the industrial revolution Great Britain, at any rate, if not Ireland, has become essentially a manufacturing country. The details of this manufacture will be dealt with in the various regions. It is possible, however, to indicate the two main types into which it can be grouped.

First there is the industrial development which has taken place on the coalfields, and which is based almost entirely on the steam power available from the coal, or in the case of metallic industries, the facilities for smelting provided by the coal.

Secondly there is the industrial development associated with the large population centres, or with the agricultural regions, based upon the local demands for its products, such as furniture and agricultural machinery respectively.

EXERCISES ON CHAPTER XLIX

1. How do tidal conditions round the British Isles influence shipping and trade? (O.S.C.)
2. Give an account of the climate of western Ireland and show how it differs from that of eastern England. (C.S.C.)
3. Write a short account of the climate of the British Isles and explain the influence of the sea on it. (O. and C.S.C.)

CHAPTER L

THE SCARPLANDS

THE structure of the area south-east of the Exe-Tees line has already been described in outline in p. 422. Figs. 155 and 156 show this in more detail. In the west is the long, curving line of hills stretching from the *Cotswolds* to the *Yorkshire Moors*. The main rock is the *oolitic* (eggstone) limestone, but this ridge must not be thought of as continuous, for there are many changes of level and variations in the strike of the strata. The chief feature of the ridge is the north-west facing scarp, while south-eastwards the layers dip under a series of softer clays, which have been eroded to form broad valleys. Beyond the clays come the *chalk* regions. The chalk layers have undergone some disturbance, the most marked being in the extreme south-east, where an *anticline* has resulted in the chalk being eroded to expose the older Wealden beds below. Enclosed between two infacing scarps these *Wealden beds* outcrop in horse-shoe shaped curves, with the *Hastings sandstones* in the centre and the *green-sands* forming an intermediate ridge in many places.

To the north and west of this Wealden uplift depressions in the chalk have been filled in with recent clays to form the *London* and *Hampshire Basins*.

To the north of the London Basin a sag in the chalk has been breached to form the inlet of the *Wash*, and here too the chalk layers have no very pronounced dip, while glaciation has formed masking drifts of *boulder clay*.

River capture.—In these scarpland regions the river drainage gives interesting examples of an erosive process known as river capture. The development of this is shown diagrammatically in Fig. 157 (a), (b), (c).

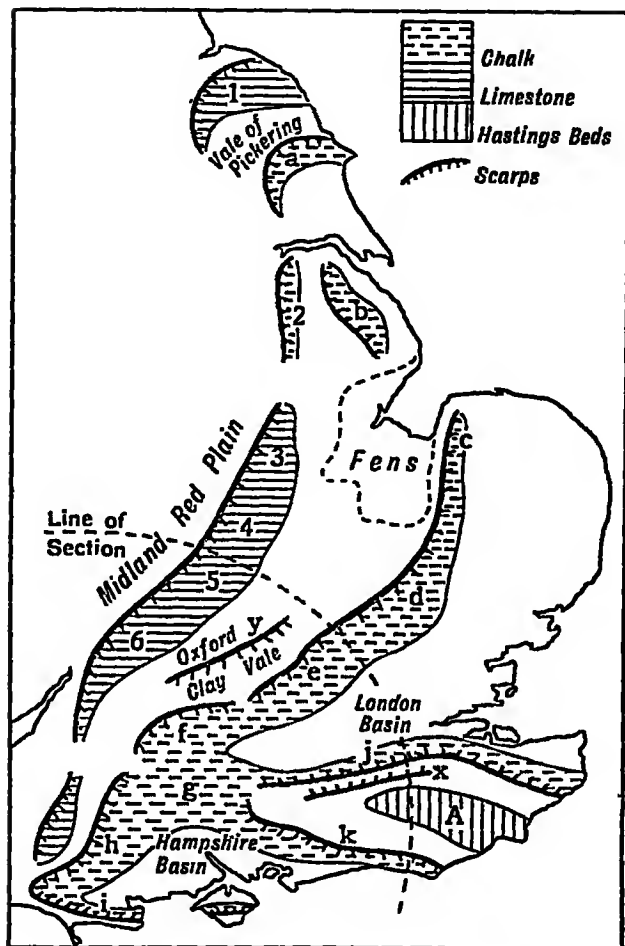


FIG. 155. SCARPLAND RIDGES.

- | | | |
|-------------------------|--------------------------|---------------------|
| 1. York Moors. | a. York Wolds. | A. The Weald. |
| 2. Lincoln Edge. | b. Lincoln Wolds. | x. Greensand Ridge. |
| 3. Leicester Heights. | c. Norfolk Edge. | y. Oxford Heights. |
| 4. Northampton Heights. | d. East Anglian Heights. | |
| 5. Edge Hill. | e. Chilterns. | |
| 6. Cotswolds. | f. Marlborough Downs. | |
| | g. Salisbury Plain. | |
| | h. Western Downs. | |
| | i. Purbeck Downs. | |
| | j. North Downs. | |
| | k. South Downs. | |

Fig. 157 (a) shows the streams that develop immediately from the normal slope of the land—the *consequent* streams. Fig. 157 (b) shows the tributaries that have developed across the slope. These erode the layers of soft rock and cut out valleys parallel to the structure lines, leaving the hard rock layers upstanding as ridges. Such streams are known as *subsequent* streams.

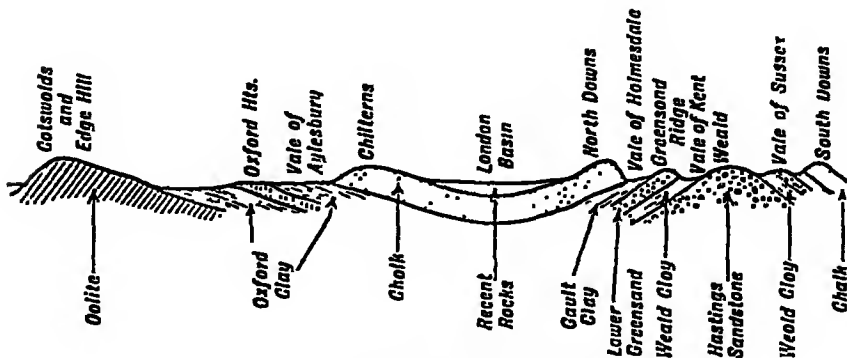


FIG. 156. SECTION ACROSS THE SCARPLANDS.
(See Fig. 155.)

Fig. 157 (c) shows how one of the subsequent streams, helped by some local detail in the slope, has eroded more powerfully than the others and has cut its way back along the soft rock layers till it has captured the headwaters of other original streams.

These *beheaded* streams have a short 'course on the other side of the ridge of hard material, and the old valleys they cut in that ridge form gaps known as *wind gaps*. The streams draining into the main subsequent stream from this ridge are flowing in the reverse direction from the original drainage line and are known as *obsequent* streams.

If the course of the Medway in Kent is studied on a large scale map it will be possible to see evidences of this development.

The Wealden Area of the South-east Peninsula

Position and build.—This region lies south of the Thames and east of the main chalk area of Salisbury Plain. It is formed by the

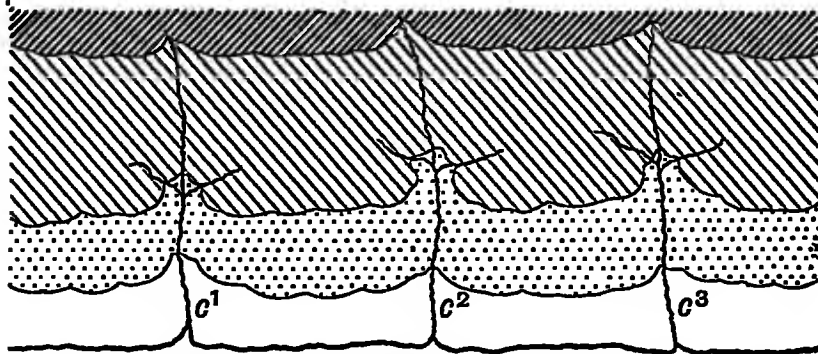


FIG. 157 (a).

"Consequent" streams (c^1 , c^2 , c^3) flowing down the original slope. Tributaries are just beginning to develop.

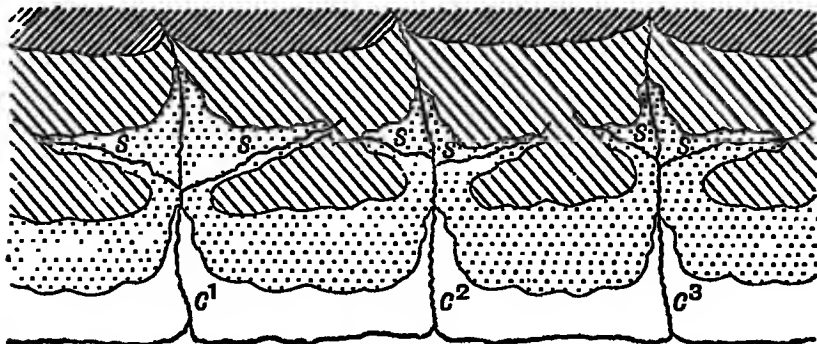


FIG. 157 (b).

"Subsequent" tributaries (s...s) are developing along a layer of soft rock. The western "consequent" (c^1) is eroding faster than the others.

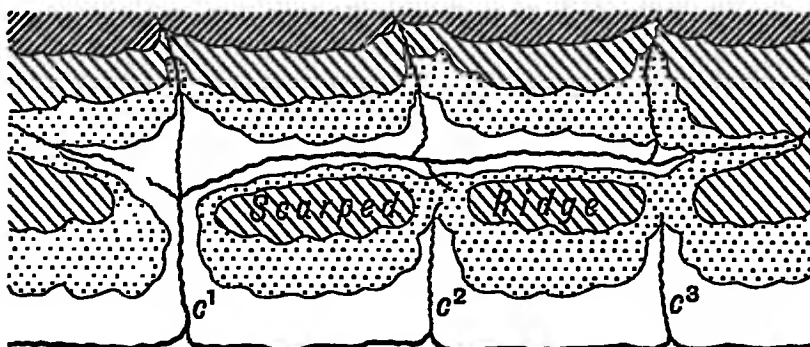
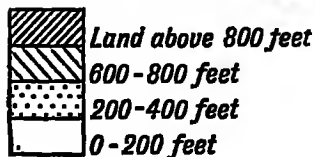


FIG. 157 (c).



A "subsequent" tributary of c^1 has captured the headwaters of c^2 and c^3 , which are now short beheaded streams. A layer of comparatively hard rock forms a ridge with an inward-facing scarp.

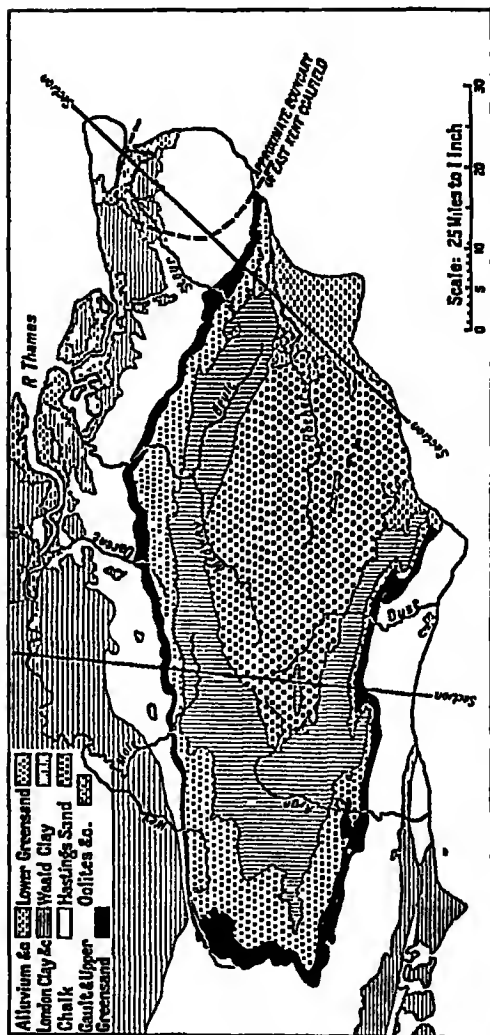


FIG. 158. GEOLOGICAL MAP OF THE WEALD.

anticline that led to the exposure of the older rocks of the Wealden core.

The main features are the chalk ridges of the *North* and *South Downs*. Immediately inside there is a clay valley region and then a

the London market favours the production of fruit and *vegetables*, and these are also grown in the estuarine area to the north of the North Downs.

Wheat growing is important in this estuarine area, on the fertile clays that cover the chalk of the North Downs, and in the valleys of the otherwise infertile Weald.

Cattle are reared in the clay vales, and in the alluvial valleys found in the gaps that the rivers have cut in the chalk.

Sheep are reared principally in two dissimilar areas, viz. on the porous South Downs chalk lands and on the alluvial *Romney Marsh*, which has been built up by the rivers behind the protecting shingle banks of tide-formed *Dungeness*. The Romney Marsh sheep are hardy, but in winter many are moved inland to the Weald—an example of transhumance.

Towns.—The chief settlements are found very largely along the spring lines and fertile soil areas on either side of the chalk downs, and the chief towns have developed at gaps in these ridges. The gap towns in the north are *Guildford* on the Wey, *Dorking* on the Mole, *Rochester* and *Maidstone* on the Medway and *Ashford* and *Canterbury* on the Stour, while in the south are *Arundel* on the Arun and *Lewes* on the Ouse. Most of these towns are market centres for their regions, but some are of greater importance. *Tunbridge Wells*, in the Weald, has become important as a spa, for it has medicinal springs.

Along the coasts are two types of town. There are the old ports, once the main ports of the country, forming the famous "Cinque" ports, the place of which has now been taken by the packet stations

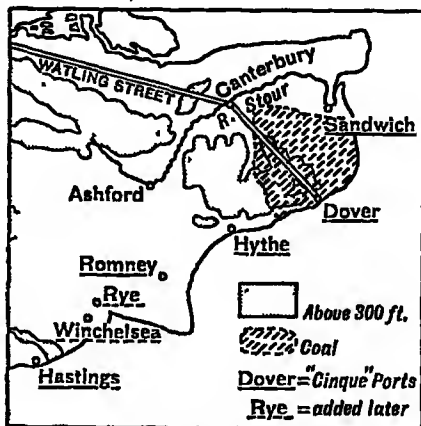


FIG. 160. CANTERBURY IN RELATION TO
(i) the Stour gap and Watling Street ;
(ii) the Cinque ports ;
(iii) the east Kent coalfield.

of *Dover*, *Folkestone* and *Newhaven*, and there are the modern holiday resorts such as *Brighton*, *Eastbourne*, *Margate* and *Ramsgate*.

The two main towns of the region grew up along the Roman Watling Street, that ran from Dover to London. Where it crossed the Stour is *Canterbury*, a bridge and gap town which, for historical reasons, is the ecclesiastical centre of the country, and was of commercial importance as the centre for the "cinque" ports. Where it crossed the Medway is *Rochester*, another bridge and gap town, which has developed a series of industries. Chalk has led to cement

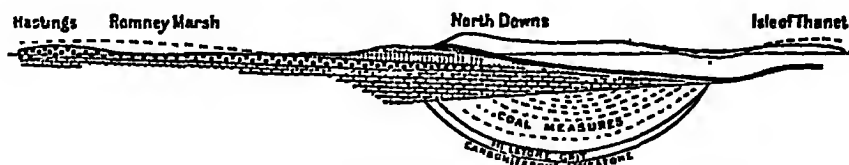


FIG. 161. SECTION SHOWING EAST KENT COALFIELD.

manufacture, local demand to the manufacture of agricultural implements, while near it, along the Medway, are paper mills which have grown up based on easy access to imported raw material and to the London market.

The development of the *Kentish coalfield*, which underlies the young rocks in the east (see Figs. 160 and 161), may lead to further industries, and possibly to the revival of the old iron-smelting industry which was once carried on with the aid of local iron ore and charcoal from the Wealden forests.

The Hampshire Basin

Position and build.—Unlike the Weald, this is a syncline or downfold in the chalk, so that the dip slopes of the chalk areas enclose regions of younger materials. Roughly it is triangular in shape. To the north lies the chalk upland of *Salisbury Plain*, with a dip in the chalk, running east to west, playing a big part in the placing of the settlements. To the west lie the *Dorset Heights* and *Cranborne Chase*, and to the east is the western end of the *South Downs*. There was at one time an almost continuous chalk rim along the south, but

a slight land movement led to the area sinking and to the sea breaking the chalk and drowning the lower valley of the *Frome*—which was the chief stream of the area. This led to the isolation of the *Isle of Wight* by the formation of the *Solent* and *Spithead* channels.

The chalk plateau to the north is a watershed for several drainage systems, but the *Vale of Pewsey*, which is drained by the *Wiltshire Avon* might well be included in this region.

Development.—In this region agriculture has undergone a steady change. The chalk areas were very famous for *sheep* rearing but sheep now play a less important part, and agriculture tends to link up with *dairy farming* where possible. The younger rocks in the basin are either mainly sandy or clayey. Both gave rise to much forest, but now the clay lands are being used for pasture, while the edges of the sandy areas, where the soil is mixed, are used for *market gardening*, the southern position being of value for this. These changes have been brought about by two big factors—the increased ease of access to the London market that railway and motor transport has provided, and the large increase in the local demand owing to the growth of the towns of the coastal belt.

Towns.—It is possible to distinguish at once two main types of town. First, there are the old market and route towns that grew up at river gap positions in the chalk rim. Chief of these are *Winchester* on the *Itchen*, *Salisbury* on the *Avon* and *Dorchester* on the *Frome*—all county towns. *Basingstoke* and *Andover* are route towns in the north of the area.

Secondly, there are the coastal towns. Most recent of growth are the holiday resorts, chief of which is *Bournemouth*, which is helped by its pine woods as well as its position. The two main towns of the region are *Portsmouth* and *Southampton*, which have long since surpassed the old ports of *Poole* and *Weymouth*.

Portsmouth grew up as the naval centre of the country when warships were built of timber from the neighbouring forests and when the main strategic considerations were defence of the Channel, and it still remains the chief English naval harbour.

Southampton was always an important port owing to its position

on the Channel and the good harbour provided by the double water-front of the Test and Itchen.

It has now become the chief liner port of the country. Factors that have led to this are many. The prolonged high tide—usually attributed to the double tidal waves provided by Solent and Spithead—is of great importance in enabling ships to reach and leave

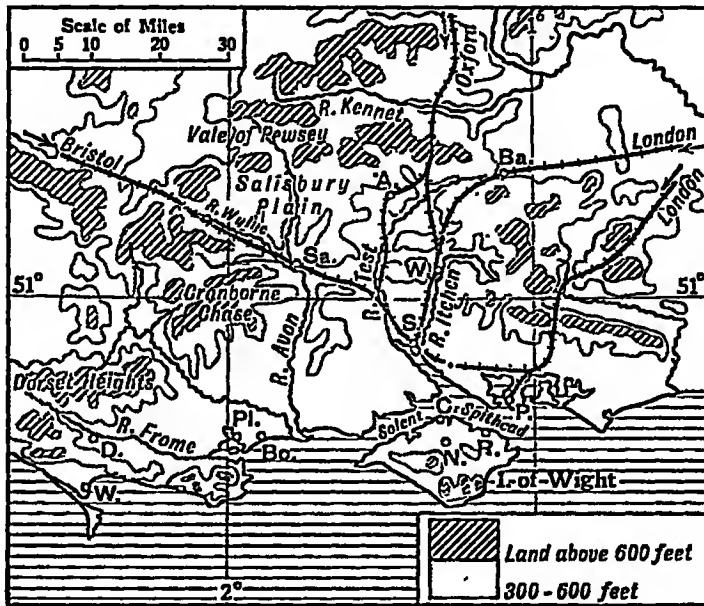


FIG. 162. THE HAMPSHIRE BASIN.

Identify the towns.

Note—(i) the position of Southampton ;
(ii) the routes into the area.

the port. The nature of the land has made dock construction easy, and the enterprise of the Southern Railway in providing good docks and efficient rail communication is of great importance.

Now that oil is used for fuel the absence of local coal is unimportant. Southampton first developed trade with the south, but with what may be called the "internationalization" of the transatlantic route it has become the chief English port for the liner services that run from north-western Europe to North America.

Besides serving its own immediate hinterland, it has more remote hinterlands in London and the Midlands. The use of oil fuel and electric power is leading to the development of industries based upon imported raw material, *e.g.* tobacco and margarine.

The Isle of Wight is really an isolated part of this area. The north of the island consists of material similar to the Hampshire basin. In the south an anticline of chalk has been eroded in a manner reminiscent of the Weald, so that older rocks are exposed. Market gardening is carried on in the north, but the chief importance lies in the many holiday resorts round its coast. Those in the north, such as *Cowes* and *Ryde* on Solent and Spithead respectively, are famous yachting centres.

Newport, in the centre, is the chief town, as it has easy communication to the south by means of a gap in the chalk ridge that runs from the Needles to Culver Cliff.

The Thames Valley

Physical features.—Although the Thames forms a link throughout this area, it really consists of a number of sharply contrasting regions. The river rises in the oolite area of the *Cotswolds*, though there is considerable evidence to show that it once rose much further west and was later beheaded by the Severn-Avon system. After leaving the Cotswolds it flows across a *clay vale*, being forced north by the minor ridge of the *Oxford Heights* and then flowing south to break through the chalk ridge at the *Goring Gap*. This upper part of its valley is often known as the Vale of Oxford. Below the Goring Gap it flows across a region of recent clays, gravels and alluvium which lie in a downfold of the chalk between the *Chilterns* to the north and the *North Downs* to the south, and which is generally known as the *London Basin*.

Development.—It is necessary to distinguish between the development of the two areas. Whereas the upper Thames valley shows all the features of development resultant upon its varying soil conditions, the lower Thames valley is dominated by London, and completely different factors prevail.

The upper Thames valley is essentially a farming region. The dip slope of the Cotswolds is fertile and *arable farming* is important, though *sheep* are important in parts of the area, particularly in the south. The clay valley is more devoted to *cattle farming*, and this is especially so in the *White Horse Vale* and the *Vale of Aylesbury*, formed by the subsequent streams the *Ock* and *Thame* respectively.

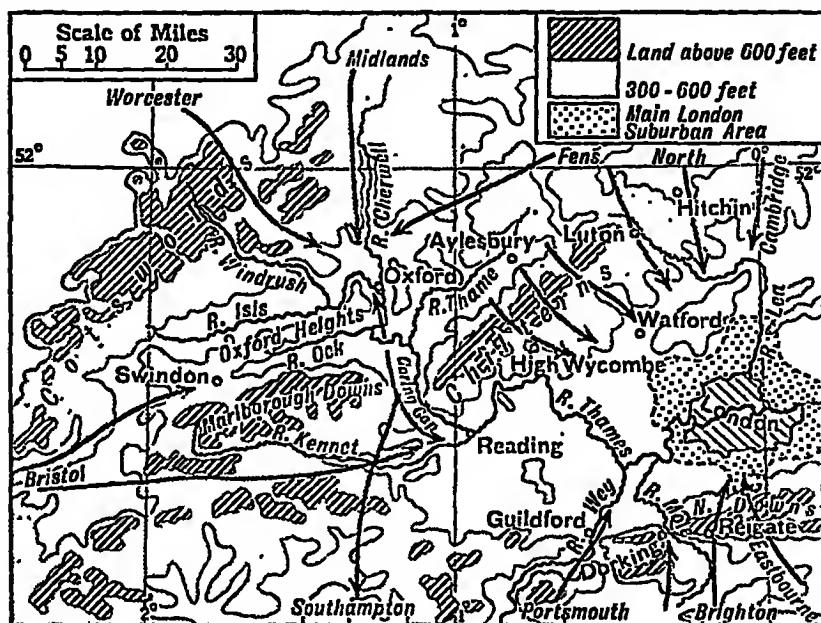


FIG. 163. THE THAMES VALLEY.
Routes and route towns.

Both of these areas supply milk to London, and the latter also supplies the Midlands.

Oxford is centrally situated for routes, there being a particularly important one northward via the *Cherwell*. It is a famous university centre and, owing to the personal enterprise of one man, is now an important centre for the manufacture of cars.

Swindon is a railway centre, and is typical of the way in which the big railways have placed their machine shops in fairly accessible places where cheap land could be obtained, rather than near industrial centres where building sites were costly.

The London Basin contains a variety of soils, some like the clays and gravels being infertile and others, particularly those in North Kent, being fertile. These have already been mentioned in connection with the Weald, although they are physically part of the London Basin. Throughout the region, however, all occupations are now concerned with supplying London. Thus there is *dairy farming* in the *Kennet* valley in the extreme west of the basin, and in Essex; there is *market gardening* in the north in Hertfordshire and in the south in Kent, and there are specialized regions, such as the area near the *Lea* valley which produces tomatoes, etc. in glasshouses, and Rickmansworth which produces watercress.

In the more purely agricultural regions the main town is *Reading*, which grew up at the confluence of the *Kennet* with the *Thames* and so controls the route north via the *Thames* and west via the *Kennet* and the *Vale of Pewsey* to *Bristol*. Its agricultural growth is reflected in its biscuit manufactures and its production of seeds.

London has been an important city from the earliest days. It grew up on the firm land provided by gravel patches to the north of the river. *Watling Street* reached the city by a causeway, presumably, across the marshes of the flood plain to the south. The building of *London Bridge* made it the head of navigation and so it became a port. Its central position in the chief agricultural areas and its ease of access from the Continent led to it becoming the capital. The study of the gradual growth of London is most fascinating, but there is no space for it here. Suffice it to say that the old city of London, the home of the merchants, grew up on the gravel areas of which *St. Paul's* is roughly the centre, and the royal city of *Westminster* grew further west, until finally the two became one, which in turn has spread out further and further in all directions. Modern facilities for fast cheap transport have accelerated this growth and have led to the development of what may be called *dormitory towns* many miles from the heart of the city, and the time seems to be at hand when many of these towns will lie far beyond the chalk rim of the basin.

The city is now the chief port and the main industrial town of the country. The old port grew up at the Pool of London below London

Bridge. Modern docks have been built in the lowlying flood plain (see Fig. 164). This flood plain has also proved of great value in providing sites for power stations, gas works, flour mills, sugar refineries, paper mills and similar concerns, all necessary to provide for the needs of the ever-growing population. The development of electric power has made possible the growth of many other factories, which all really owe their origin to the market provided by the population. Typical of these are the factories at *Slough* and at *Welwyn*. Lower down the river the marshlands have provided sites for heavier industries, such as the great motor works at *Dagenham*.

Eastern England

Physical features.—The whole of eastern England is alike in being a region of comparatively level country with no prominent physical features, while soil and climatic conditions make it essentially a farming area. It consists of two fairly distinct regions—the peninsula of East Anglia, and the area of the Wash drainage and the adjacent part of Lincolnshire.

In the *East Anglian peninsula* the chalk ridge which lies to the west is masked by much fertile *glacial material*, though on the borders of Norfolk and Suffolk is the infertile *Breckland Heath*, and to the east of it lies a region of more recent soils which vary in fertility. The chalk edge is broken by the big shallow inlet of the *Wash*. Into this flow the four main rivers, *Witham*, *Welland*, *Nen* and *Ouse*, which drain the land between the chalk and limestone ridges north of the Thames drainage area. The lower courses of these rivers were once a swampy waste with one or two "islands" of firm land like Ely, but they were drained in the seventeenth and eighteenth centuries, so that the *Fenlands*, as they are called, are now regions of great fertility. The land immediately adjoining the Wash is mainly silt, but further inland is the peat fen.

In the east is a rather similar area where the rivers *Yare*, *Bure* and *Waveney* filled in the region behind the tide-formed spit on which *Yarmouth* is built and formed a marshland region in which there are still several large shallow lakes famous as the *Norfolk Broads*.

Between the Wash and the Humber the county of *Lincoln* shows a diversity of formations, for the chalk *Wolds* and the limestone *Edge* are close together, separated by only a narrow clay valley, while along the coast is a region very like the Fens.

The whole of the area has a similar climate. There is a comparatively large temperature range (38° - 63° F.) and the rainfall is low. This gives bright sunny summers and more frosty winters than are experienced by many other parts of the islands.

Development.—These climatic factors, in conjunction with the level land and fertile soil, have helped the region to become important agriculturally. It was to this area that the crop rotation that was developed in Flanders was first introduced into England.

This rotation was based on cereal production—*barley* in Norfolk, *wheat* in most other areas, with root crops and *clover* grown alternately so as to provide fodder for sheep or cattle according to district, the main sheep areas being in North Norfolk and on the Lincoln wolds.

In modern times the competition of cheap overseas wheat, mutton and wool has led to changes. One of the principal cash crops of the region is *sugar beet*. This industry began just before the War and has been helped by Government subsidy since, and it is almost entirely concentrated into these eastern counties. *Cattle* have now become more important than sheep, and in addition to the beef cattle reared in the marshlands of East Norfolk and Lincoln, milk production to supply London or the Midlands is developing.

The Fenlands have developed specialized farming, notably *potatoes* in Lincolnshire, *bulbs* in the Spalding area and *fruit* around Wisbech. Fruit and vegetable canning have, in the last few years, introduced a new factor into the farming life of the Fenlands and Norfolk.

Towns.—In such an area the towns are mainly market towns and, with few physical features to give special site factors, there are small market towns dotted over the region about ten to fifteen miles apart—distances determined in the days when people walked to market.

Here and there towns have developed at more definite route positions. The largest town is *Norwich*, the capital of Norfolk,

which grew up at the confluence of the Yare and Wensum and at the old head of navigation. It was once a big wool centre, but it now makes *shoes*, based partly on local leather and partly on the skill of the old weaving centres, and *mustard* and *starch* from local raw

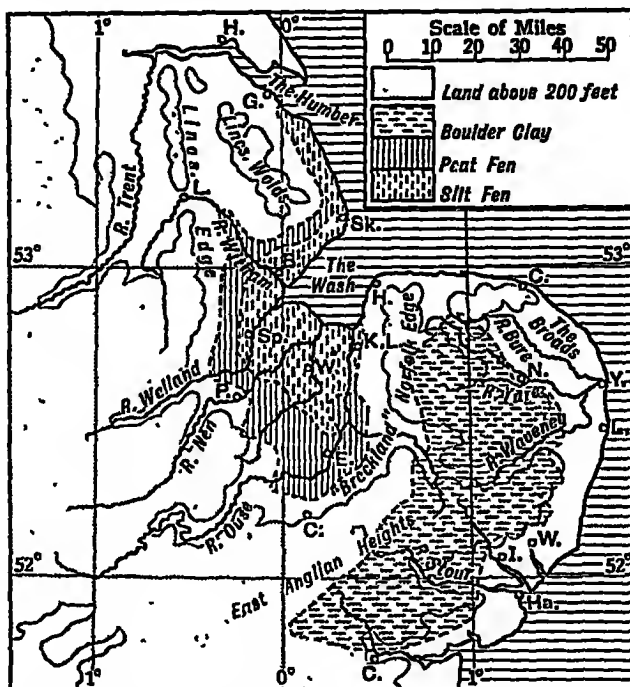


FIG. 165. EASTERN ENGLAND.

Identify the towns.

Note—(i) the very large area of level land ;
(ii) the extent of the Wash drainage area.

materials, and it has a variety of general industries based on the local market.

Ipswich, the capital of Suffolk, grew up where the route into the peninsula crossed the Orwell at the head of its estuary. In common with *Woodbridge*, it is a big *flour milling* centre, and it has a big manufacture of *agricultural implements*.

Lincoln grew up an important route centre where the Witham makes a gap in the limestone ridge. It has easy access to the iron and coal of the Midlands and makes agricultural machinery.

Cambridge, famous for its university, grew up at the edge of the Fens at a bridge point. The fruit from the Fens leads to *jam* manufacture, the adjacent chalk ridge provides a raw material for *cement*. Standing in the clay valley it has clay for *brick* works, and the University gave an impetus to manufacture of *scientific instruments*.

Peterborough similarly stands at the edge of the Fenland, and has brick works and makes agricultural implements.

Along the coast are a series of ports and holiday resorts such as *Skegness*, *Humstanton* and *Cromer*. The holiday resorts have grown up owing to the fine sands and the dry bracing climate. There are three types of ports. On the Wash are the old ports of *Boston* and *King's Lynn*, now of little importance owing to silting. *Harwich* is a modern packet station for Holland, Germany and Denmark. The chief ports along the coast are the fishing ports.

The North Sea fishing industry.—This is by far the largest fishing industry of the country. It has developed largely owing to warm shallow waters of the North Sea, and particularly of the *Dogger Bank* area. In such waters there is a plentiful supply of *plankton*, on which great shoals of fish feed. There are two main types of fish, surface fish and bottom fish. The bottom fish are caught by a *trawl* net dragged along the bottom, or by *line* in the case of cod. They are fished for all the year, and are landed very largely at *Hull* and *Grimsby*.

The main surface fish is the *herring*, great shoals of which gradually move southwards during the late summer and autumn. These shoals are followed by fleets of *drifters*—boats using long surface nets. The fishing thus starts in Scotland, but culminates in the autumn fishing season of the East Anglian ports of *Yarmouth* and *Lowestoft*. The herring are salted, dried, or smoked into bloaters and kippers, and there is a large export to the Baltic and Mediterranean areas, though this trade has declined since the War.

The other main surface fish is the *mackerel*, which comes into the North Sea during summer, when that sea is warm, but returns to the Channel in autumn.

Although Hull is a big fishing centre, the ports that are dependent on the fishing are Grimsby, which is nearest to the Dogger Bank and which can serve the north as well as Yorkshire, and Yarmouth and Lowestoft, which serve London and the Midlands.

EXERCISES ON CHAPTER L

1. Account for the importance of London as (a) capital city, (b) port, (c) manufacturing centre. (C.S.C.)
2. Draw a sketch to show the relief and drainage of the Thames Basin and indicate the human activities within the basin.
3. Show how the chief routes from London make their way across the chalk which surrounds the London Basin. (O. and C.S.C.)
4. What do you understand by a "gap town"? Name three and explain their position and growth. (O. and C.S.C.)
5. Write a brief account of the geography and chief occupations of the Hampshire Basin. (O. and C.S.C.)
6. Describe the physical features of East Anglia. Show how they affect population and products. (O. and C.S.C.)
7. Write a geographical description of the Fens under the headings of soil, drainage, erosion, and economic production. (O. and C.S.C.)

CHAPTER LI

WEST OF THE SCARPLANDS

THE western edge of the scarps has been noted as consisting of a ridge of material in which limestone is the main rock, and which forms a fairly continuous scarp from the Yorkshire moors to the Cotswolds.

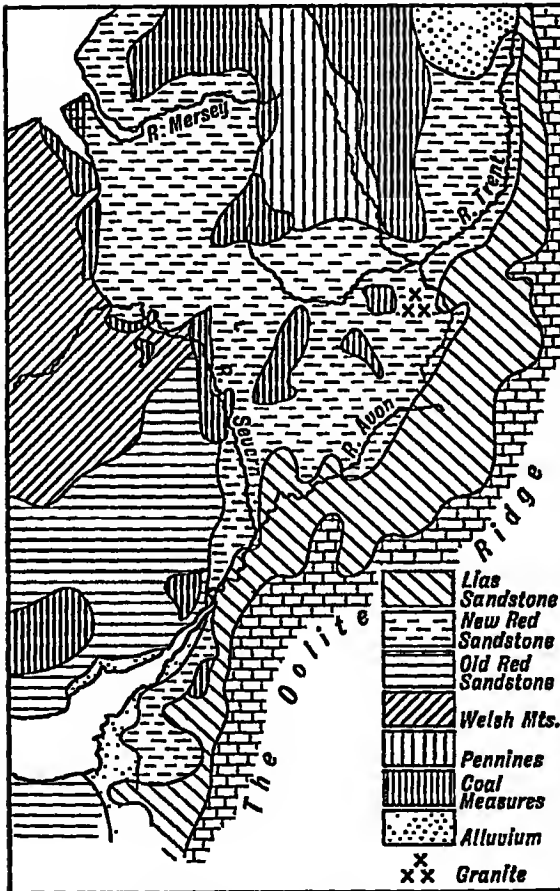


FIG. 166. THE RED PLAIN.

South of these hills the ridge is still found in close conjunction to the chalk rim of the Hampshire basin. Throughout its length this ridge overlooks on the west a lowland region, often called the Midland plain, in which the main rock is *new red sandstone*. It is roughly V-shaped, with the lower end of the V stretching southwards along the Severn valley and the two upper arms enclosing the south of the Pennines.

The western edge of this lowland lies up against the older rocks of the Welsh highlands and of the south-western peninsula, and in it stand up many islands of old

rock. Some of these islands consist of coal measures and hence they have become the dominating factors in determining the development of the adjacent regions.

In the extreme south this red plain area is very narrow and merely forms an isthmus joining the old rocks of the south-west peninsula to the mainland. It will be convenient to deal with this plain, or the main parts of it, in three regions. The southern region will be considered in conjunction with the south-western peninsula, since it is linked with it, and this will be taken first as being the last area of what may be called agricultural England. The other two regions may be taken roughly as coinciding with the basins of the Severn and the Trent.

The South-Western Peninsula

Physical features.—The isthmus joining this peninsula to the mainland has just been mentioned. It can be taken as the lowland area lying south of the *Mendips*—an island of carboniferous limestone, and west of the *Dorset Heights*. Immediately south of the Mendips comes the broad *Plain of Somerset*, much of which is alluvial. South of this are the *Blackdown Hills*, which are a plateau of greensand, and then to the west of these is the *Plain of Devon* or the *Exe* valley. West of this lie the old rocks of the peninsula. Broadly speaking, its relief can best be understood if it is thought of as consisting of two main upfolds (running east to west). In the north is the upfold forming *Exmoor* and the *Quantock Hills*, both made of *Devonian* rocks—old red sandstone and others of the same age—which are also found north of the Bristol Channel. In the south another upfold was marked enough to bring to the surface *intrusive* rocks of igneous type, and these have been left upstanding to form the uplands known as moors, chief of which are *Dartmoor*, *Bodmin Moor* and *Hensbarrow Downs*. Between the two upfolds is a lower area consisting of rocks of the coal period—but with no coal—forming the region occupied by the *Vale of Crediton* and the valleys of the *Tawe* and *Torridge*.

The peninsula has undergone various changes of level, and the most marked effect has been the forming of long inlets known as

Farming is thus mainly concerned with cattle. The plain of Somerset is a noted *dairy farming* area, while Devon and Cornwall, apart from local supplies and the famous cream, are more concerned with *beef* production. *Sheep* are reared principally in the Blackdown area and led to the old carpet industry of Axminster, though that has now been moved.

Wheat is grown round Exeter and in the sheltered *Vale of Taunton*, and it is in these regions, too, that *apple* production attains anything more than local importance. The mild climate of Cornwall has led to a production of *early fruits and vegetables* along the south coast, and the *Scilly Isles*, lying to the west, are famous for the production of early spring flowers.

The influence of environment in fostering seafaring has been noted already. The fishermen of the coasts have for centuries been important in the seafaring life of the country. The principal fish is the *pilehard*, which is landed mainly at *Newlyn*, but this is declining in importance. *St. Ives* is the centre of *herring* fishing, and *Brixham* is noted for *flat fish*. The fishing industry of the region, however, is declining in importance as distance from markets and the highly individual nature of its organization prevent it from competing with the more industrialized fishing centres of the North Sea and the Irish Channel.

The old fishing villages have now a more modern source of income, for the beauty of the coastal scenery and the picturesque nature of the villages themselves attract both artists and holiday-makers.

The old rocks of the peninsula have given rise to *mining* industries. The metallic mining industries have declined. For centuries Cornwall was a big producer of *tin*, but now most of the accessible seams are worked out and the old tin mining centres of *Redruth* and *Camborne* find it difficult to compete with overseas producers.

The granite areas, however, give two productions. The *granite* itself is quarried for road making, but far more important is the *kaolin* or china clay formed by decomposition of part of the granite. This is dug out and washed clear of impurities and then exported—mainly to the pottery areas of the Midlands and to the U.S.A. The

main centres are round *St. Austell*, the ports handling it being *Fowey*, *Plymouth* and *Falmouth*.

Towns.—The towns of the region are many of them coastal, and all show the influences of route control.

Taunton is the market town of the fertile valley of the Tone, and controls the routes through it, so that it is an important centre on the routes into the peninsula.

Exeter is the chief centre of the region. Standing at a bridge point at the head of navigation of the Exe, it is the focus of routes into the peninsula and occupies a nodal position. It is an old Roman centre and was the terminus of Fosse Way.

Plymouth, on the magnificent harbour formed by the combined estuaries of the Tamar and Plym, is too far away from the main centres of the country to be a big commercial port. It is a port of call for Atlantic liners, mails and passengers being landed in order to take advantage of fast rail transport. The adjoining *Devonport* is a big naval station.

Bodmin, the old capital of Cornwall, is situated at a good route position between the Camel and the Fowey, but *Truro*, which has a nodal position similar to Exeter, is the main centre of the county nowadays.

The main holiday resorts are *Torquay*, *Falmouth* and *Penzance* on the south coast.

Barnstaple and *Bridgwater* are old ports situated along the north-east coast.

The Severn Valley

Physical features.—Although it is convenient to treat the valley of the Severn as a whole, it must not be thought of as being one area of similar features. Like the Thames, it can at least be divided into two, if not three areas.

The river rises in the old rock area of *Plynlimmon* in mid-Wales and its north-easterly course shows clearly its original outlet. After leaving the Welsh highlands it flows out on to the lowland and crosses the *plain of Shrewsbury*. The blocking of its northern outlet during glacial times has led to it turning south-east, and here is the dis-

tinative middle Severn area where the river flows in a narrow valley and at one point, between *Ironbridge* and *Bridgnorth*, in a gorge, across an upland region consisting mostly of coal measures and sandstones, and which is really an eastward extension of the Welsh highlands. These are often known as the *Shropshire Hills*, the main hills being *Wenlock Edge* and the *Clee Hills*, while *The Wrekin*—to the east of the river—is an isolated area of older igneous rock. To the east of this region lies the *Midland plateau*.

South of this area the Severn once more flows across a plain. It is joined by the *Avon*, which drains the area between the limestone ridge and the Midland plateau. To the west stands the sharply defined ridge of the *Malverns*, an upthrust of old rock. To the west of these lies the *Vale of Hereford*, drained by the *Wye* and its tributaries and consisting of an undulating plain of old red sandstone. Before it joins the Severn the *Wye* crosses a plateau of carboniferous rocks forming the area of the *Forest of Dean*. The southern limit of this lower Severn basin may be taken as the Mendips, which form the northern boundary of Somerset.

Although situated to the west of the country the Severn basin enjoys a good climate, for, lying in the shelter of the Welsh highlands, it is saved from an excessive rainfall.

Development.—Throughout its length occupations vary considerably. The mountain area and the upper valley region is mainly devoted to *sheep* rearing. The plain of Shrewsbury is a rich farming area, *cereals*, *cattle* and *sheep* all being important.

The plateau region contains two small coalfields, the *Coalbrookdale* and the *Forest of Wyre* (near *Stourbridge*). Although these produce only small amounts they are important as being old centres of the iron industry. Coal was first used for smelting in this area and the town of *Ironbridge* marks the place where the first iron bridge was built. *Kidderminster* is still noted for its *carpets*, but, generally speaking, industry has declined in this region.

The lower Severn valley is associated with three particular developments. In the lowlands near the rivers *cattle* are reared in large numbers, particularly so in Hereford and along the Severn below Gloucester. It is a famous *fruit growing* district, the valley of the

south-east important for the growing of *hops*. Finally, the position of the region between the two large industrial areas of South Wales and the Midlands has made it important for the growth of *vegetables*, *Bromsgrove* in the north and *Gloucester* in the south being noted centres.

There are two *coalfields* in the area. The *Forest of Dean* only mines a small quantity, mainly near the towns of *Lydney* and *Cinderford*, but the old iron industry, which grew up using charcoal, has ceased.

To the east of Bristol are a group of small coalfields which supply coal to *Bristol* and neighbouring towns.

The southern end of the Cotswolds was once the seat of a large *woollen* industry based upon local sheep rearing and water power. This "West of England cloth" industry is now mainly centred in a series of valleys in the scarp of the ridge round *Stroud*, but it extends as far south as *Bradford-on-Avon* and *Trowbridge*, and east to *Witney*, which is noted for *blankets*. Mainly speaking, the industry is able to continue by specialization, and the chief products are fine suitings.

Towns.—Owing to the agricultural development of the valley many of the main towns are typical market centres, such as *Welshpool* in the upper Severn valley, and *Evesham* in the Avon valley. Some, however, have grown to a greater importance owing to good route positions. In the days when Wales was not completely under English rule, the castle towns guarding the routes into that country were of importance. Chief of these are *Hereford*, controlling the route via the Wye, *Ludlow* on the Teme, and *Shrewsbury*, which controlled the route via the Severn and the north-south route along the edge of the highlands.

Along the lower Severn are three important centres. *Worcester* controlled the routes just below the Severn gorge area, but *Gloucester* was the main route centre of the valley, for, being at the lowest bridge point of the river, it controlled the main route into Wales. As the head of navigation it became a port serving the valley and the Midlands. Though the river is unsuitable for modern traffic the construction of the *Berkeley ship canal* still enables it to act as a port

for the Midlands, but its trade is completely overshadowed by that of Bristol.

Bristol grew up at a bridge place and good defensive site on the Avon just above Clifton gorge, and it had the advantage of an easy route to London via the Vale of Pewsey and the Kennet valley. It had an important Mediterranean trade for centuries, but its period

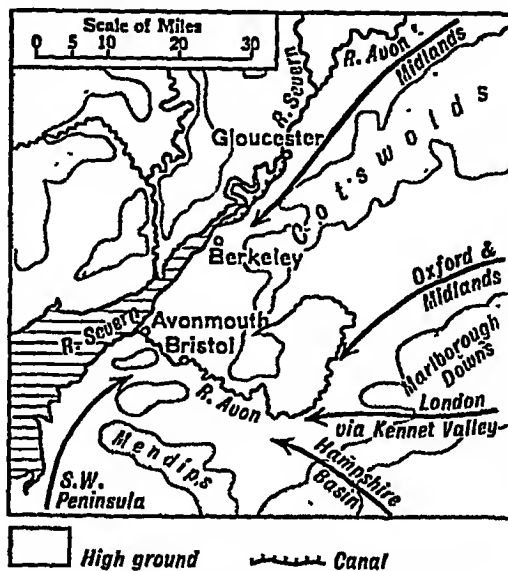


FIG. 169. BRISTOL AND GLOUCESTER.
The arrows indicate routes.

of greatest wealth came with the development of the slave trade to the West Indies and America, and the consequent import of sugar and tobacco. This association has continued and industries have grown up based upon it, viz. *sugar refining*, *tobacco factories* and *chocolate making*. It is now a big centre for the import of fruit. The old docks were not suitable for modern ships and big modern docks have been built at Avonmouth, though the large tidal rise experienced on the funnel-shaped Severn estuary is a handicap.

Further up the Avon is *Bath*, which owing to its medicinal springs has been a health centre since Roman times. Similar towns in the Severn valley are *Droitwich* and *Cheltenham*, and *Leamington* in the

Avon valley has grown for the same reason, though the most noted town in that valley is Shakespeare's *Stratford*.

The Trent Valley and the Industrial Midlands

Physical features.—The northern part of the red sandstone plain lies round the southern edge of the Pennines. Most of this northern part lies within the drainage area of the Trent, and that river can be used as the basis of a study of the region.

It rises on the western slopes of the *Pennines* and flows southward across a region where the coal seams are exposed to form the North Staffordshire coalfield. It then flows south-east, between the Pennines and the Midland plateau, and then turns east and then north-east round the edge of the Pennine folds. In this middle part of its course it is joined by streams from the north such as the *Derwent*, which drains the southern end of the Pennine upfold, and from the south by the *Tame*, draining the Midland plateau, and the *Soar*, flowing along the foot of the limestone ridge.

Development.—The soils of these regions are fertile, and, on the whole, the predominating agricultural occupation was *cattle* rearing, this being particularly important in the valleys of the Soar and Trent.

The development of the region, however, has been dominated by a series of isolated islands of older rocks that thrust up through the red sandstone. With the exception of the *Charnwood Forest*, which is an upthrust of old granitic material, these consist of carboniferous rocks, and the coal measures belonging to these have led to a series of industrial areas developing which together dominate the region. Associated with these, it is convenient to consider here the comparatively minor coalfields found along the eastern and western flanks of the southern Pennines, though strictly speaking they belong geologically to the group of Pennine flank coalfields that will be considered under the heading of Northern England.

Two general points can be noted about the industrialization of this area. The scattered nature of the coalfields and the consequent varying types of local details have led to a considerable diversity of occupation. The inland situation of the fields, distant, on English standards, from tidal water, have made transport costs an important

factor and have resulted in the development of comparatively light industries in which skill in manufacture rather than quantity of material is the main consideration. It will be most convenient to consider each coalfield and its associated industries and towns in turn.

The North Staffordshire coalfield.—Lying in the upper valley of the Trent on the flanks of the Pennines, this region was associated with the manufacture of *pottery* and earthenware before the utilization of coal. The enterprise of men like Wedgwood led to the industry becoming firmly established when the coal could be utilized. It is now so important for the manufacture of earthenware and china that it is known as "The Potteries". In addition to local clay, *kaolin* is imported from the south-west peninsula, flint and other glazing materials also being imported. The region has been helped by the development of canals, which now make it accessible from the Trent and Severn, but the most important is the *Trent-Mersey canal*. The many small towns associated with the industry were, in 1925, amalgamated to form the city of *Stoke-on-Trent*. *Newcastle-under-Lyme* is a residential centre near-by.

The South Staffordshire coalfield.—The coal measures form the centre of the Midland plateau and were some of the earliest to be worked. The chief mining area in modern times is in the *Cannock Chase* area of the north, and the hidden seams, under the surrounding younger rocks, are now being worked.

The coal measures here contained *iron ore* deposits, which, in conjunction with local forests supplying charcoal, and nearby limestone suitable for a flux, led to *iron smelting*, which, in early industrial days of the coalfield, led to this area being known as the "Black Country". Now the iron ore is exhausted, and, as it is too far inland to make the import of ore worth while, there is practically no smelting. The old *hardware* industries that grew up in the adjacent towns still continue, for they are mainly based on skilled workmanship, and alongside them have grown up many new *light industries* connected with motors and electrical developments. The chief town is *Birmingham*, which grew up off the coalfield in the valley of the Tame, but within easy access of the Severn-Avon

valleys. It is connected to the coal areas and to the rest of the country by rail and by a series of canals, this being the only region

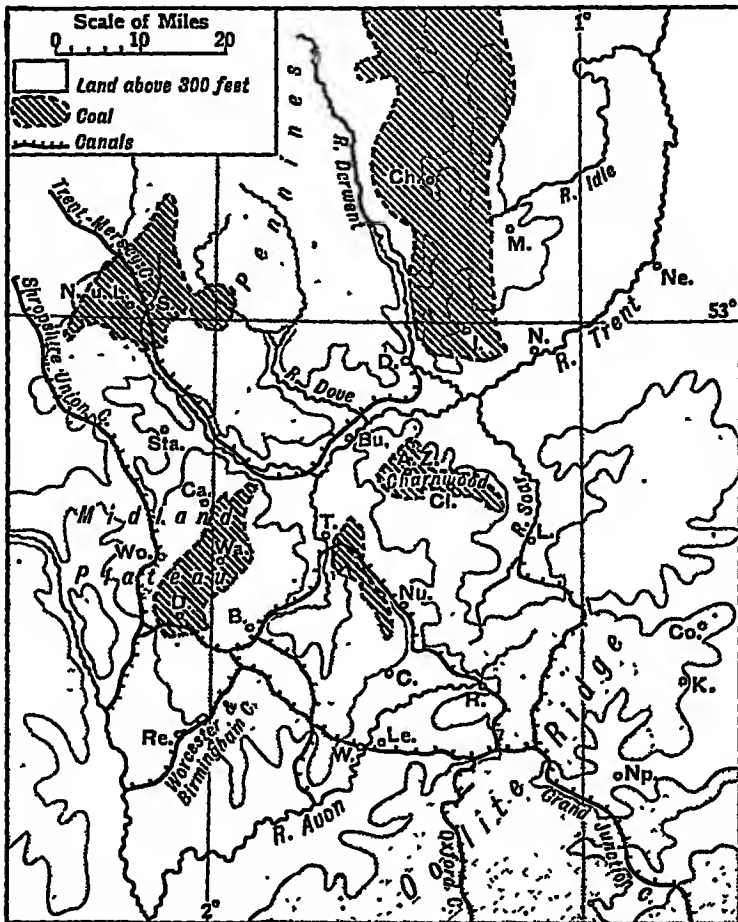


FIG. 170. THE TRENT VALLEY AND THE INDUSTRIAL MIDLANDS.

Identify the coalfields and the towns.

Note the canals serving the area.

of the country in which canal transport still plays an important part. Round about are a series of towns also connected with the hardware trade, chief of which are *Wolverhampton, Dudley, and*

- *Redditch*. *Walsall* and *Stafford*, which lie off the coalfield, have *leather* industries that have grown up on account of the cattle rearing of the Trent valley.

The Warwickshire coalfield.—This consists of an outcrop of coal measures, and the coal is worked in a region stretching from *Tamworth* to *Nuneaton*. The main industrial centres lie off the coalfield to the south, and are actually in the upper Avon valley. *Coventry* is a noted centre for the manufacture of *motor-cars* and *cycles*, while *Rugby*, an important rail centre, manufactures *electrical equipment*.

The Leicester coalfield and adjacent areas.—Along the western edge of the old rocks of Charnwood is a small coalfield known as the Leicester coalfield. The main mining centres are *Ashby-de-la-Zouch* and *Coalville*, but there are no really large industrial towns on or adjacent to the field. The industrial centres of this part of the basin have grown up owing to certain local factors. The chief industrial town is *Leicester*, in the Soar valley. This town occupied an important route position in Roman times, but its modern growth is dependent on other factors. The *sheep* from the near-by *Leicester Heights* of the limestone ridge provided a raw material which led to a *woollen* industry. Textile industries in this area have been influenced by the local invention of the circular "stocking frame". As a result, Leicester has become noted for its *hosiery* industry, a name including all textiles made on circular frames. The pastures of the Soar valley provided *leather* and Leicester, along with the adjacent centres of *Northampton* and *Kettering*, is noted for its *boots and shoes*.

This portion of the limestone ridge contains valuable *iron ore* deposits. Until recently the main developments have taken place in Lincolnshire near *Scunthorpe*. Modern developments have led to the opening up of a big new field at *Corby*, to the north of *Kettering*, and a new iron-smelting town is in process of growth.

The Derby and Nottingham areas.—Similarly placed to the North Staffordshire field to the west, the southern end of the flanking coalfield on the east of the Pennines extends into this region, and there are mining centres in the valleys of the Trent tributaries that drain the south of the Pennines. The chief Derbyshire mining

centre, however, is *Chesterfield*, while in Nottinghamshire *Ilkeston* and *Mansfield* are important centres.

Derby grew up as a route centre, for the routes along the Trent valley are here crossed by a route via the Soar and Derwent valleys that runs from London to Manchester. The town has big *railway works* and manufactures *motor-cars*. *Burton*, further up the Trent, has become a big *brewing* centre owing to local supplies of *gypsum* making the water particularly suitable.

Nottingham grew up at an easily defended position overlooking the Trent. Local supplies of iron and charcoal led to iron smelting and this old industry is now reflected in its *cycle industry*. The forests providing charcoal also provided tanning material for *leather* industries. The chief modern developments are the manufacture of *hosiery and lace*, dependent on the local invention of the stocking frame, and its factories for *tobacco* and *chemists' supplies*. Below Nottingham the Trent flows through an essentially agricultural region, the main town being *Newark*, which is a market centre. The Humber, into which it flows is connected primarily with the Yorkshire industrial area, and its ports will be considered in conjunction with that region. It should be noted that the lower reaches of the Trent are subject to a tidal wave known locally as an *eagre*.

EXERCISES ON CHAPTER LI

1. Compare and contrast the geographical condition in the South-Western Peninsula of England with those in South-Eastern England (approximately Kent, Surrey and Sussex).

2. Describe the surface features of the land observed in a journey from the lower Severn eastwards to the sea. What forms of agriculture are associated with the different belts? (S.L.C.)

3. Shew by a sketch map the traffic routes by which the manufactures of the Black Country reach the following ports: Liverpool, Grimsby, London, Bristol. (L.C.S.)

4. Write a brief account of the geography and chief occupations of the Trent Basin. (O. and C.S.C.)

5. Describe the position of three coalfields in the Midlands, south of the Trent. What industrial centres and industries have developed near each of these coalfields? (C.S.C.)

6. Describe the physical features of Devon and Cornwall. Show how they affect population and products. (O. and C.S.C.)

CHAPTER LII

NORTHERN ENGLAND

Physical features.—The outstanding feature in Northern England is the *Pennine upland*. This has been formed by uplift along a

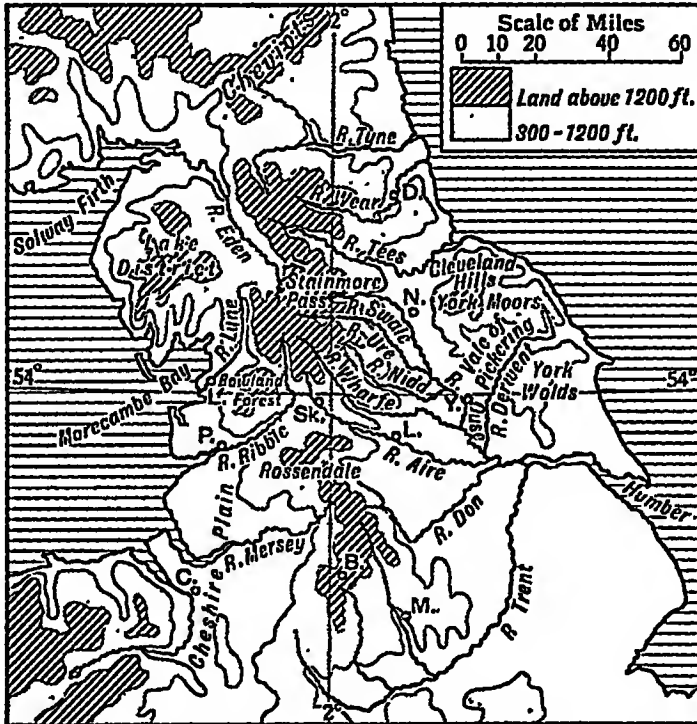


FIG. 171. NORTHERN ENGLAND.

Identify the towns.

- Note—(i) the small areas of lowland on the west ;
(ii) the drainage system of the eastern Pennines.

north-south line, and consists of rocks in the carboniferous series. It is not an absolutely simple anticline, for the western edge is

marked by faulting for a considerable distance and in general the slope is from west to east, so that the main drainage is in that direction, and the rock layers are tilted rather than folded.

Another line of uplift running roughly east to west has resulted in the formation of the *Cumbrian massif* or the *Lake District*. In this the upfolding was marked enough to bring older material through the Pennine rocks, so that the centre of the area consists of *igneous* rocks.

Faulting has led to east-to-west gaps. In the north a series of faults forms the *Tyne gap*, which divides the Pennines from the *Cheviots*. In the centre is the *Aire-Ribble gap*, and between these two lies a less marked gap known as the *Stainmore pass*.

To the north and south of the Ribble valley two spurs of the upland extend westward, the *Bowland Forest* and the *Rossendale uplift*.

It will be seen that on the west there is thus a sharply defined edge to the upland, with a series of isolated lowlands divided by westward spurs. On the east the older rocks dip gently under the younger rocks which continue the Midland plain, and there is a continuous lowland between the Pennines and the northern end of the scarplands.

Immediately south of the Aire-Ribble gap the uplands are at their lowest and narrowest. This has two important effects. The surface rock of the upland is *millstone grit*, streams from which contain pure soft water. On the flanks of the area lie the great coalfields, for the uplift was not marked enough to expose the coal seams to complete erosion.

To the south of this region, in the *Peak district*, the uplift was sufficient to expose the underlying *carboniferous limestone*, and north of the Aire-Ribble gap the east-west uplift associated with Cumbria has also led to the exposure of great areas of the same rock. In many places these limestone regions show examples of Karst scenery. To the north of this uplift the coal measures are again found on the flanks. It will thus be seen that, although the whole upland area of Northern England is formed of carboniferous rocks, earth movements and subsequent erosion have removed the coal

save at what may be approximately described as the four corners of the region.

The Pennines themselves consist, then, of an upland region which is in many ways more of a *dissected plateau*, for the surface is com-

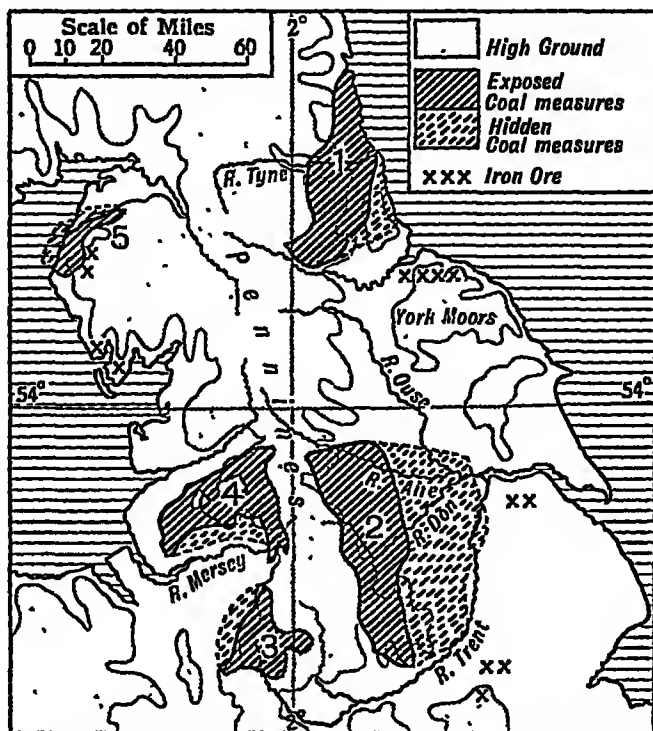


FIG. 172. THE "FLANK" COALFIELDS OF THE PENNINES.

Coalfields:

1. Northumberland and Durham ;
2. Yorks, Derby and Notts ;
3. North Staffs ;
4. Lancashire ;
5. Cumberland.

paratively regular, save for the deep entrenchment of the valleys produced by faulting and river action. The whole region consists of wind-swept moorlands and the main occupations are connected with *sheep* and *cattle* rearing, and these are carried on in the valleys or dales, particularly on the east, though the moorlands are used for sheep pastures in summer.

Naturally there are few settlements, and the only towns of any size are *Skipton*, which is an important route centre in the Aire-Ribble gap, and the towns of *Buxton* and *Matlock* in Derbyshire, which have grown up owing to mineral springs.

Northern England—Eastern Regions

Along the east of the Pennines the coal measures dip under the rocks of the Midland plain, and these in their turn dip under the limestones and chalks of the scarplands.

The northern scarplands have been left until this chapter, but they show many features similar to those areas south of the Humber. The chalk ridge forms the *Yorkshire Wolds*, with the scarp here turning eastward and the ridge culminating in *Flamborough Head*. South-east of this chalk area lies the glacial region of *Holderness*, which is devoted to cereal growing and cattle pasture.

The limestone ridge also turns east, for it is associated with the east to west uplift that led to the formation of Cumbria.

North of the *Yorkshire Moors* lie the *Cleveland Hills*, and these produced great quantities of *iron ore*, which led to the growth of Middlesbrough.

Between the Wolds and the Moors lies the *Vale of Pickering*, which, owing to the natural easterly outlet being blocked by morainic material, is now drained southward through a gorge cut by the overflow of the resultant lake. The vale is a rich *cattle* rearing centre.

The valleys of the Ouse and Tees.—North of the Humber the main lowland is drained by the *Ouse*, which is generally regarded as having captured the streams that drained eastward from the Pennine slope. In many ways this region is similar to the lower Trent valley, of which it is geologically a continuation. Lying in the shelter of the Pennines, it is able to grow *wheat* and *barley*, and it is the most northerly area growing wheat as a main crop. Cattle rearing is important near the rivers, and *dairying* and *vegetable* farming are becoming more important owing to the growth of local demand. There are many signs of glaciation, and chief of these is an east to west morainic ridge, and at the point where this is crossed by the Ouse stands the main town—*York*. This town grew up at the

important route-crossing thus formed, and was also important as the tidal limit and head of navigation. It thus became the market town of the vale, and as this was the chief agricultural area of the north, it became an important strategic and ecclesiastical centre. The area which it controlled is shown by the size of its shire, which for convenience had to be divided into three "ridings" (or third parts).

In the north, *Northallerton* controls the narrow gap into the *Tees valley*, which is separated from the Vale of York by another morainic ridge. This valley is given over very largely to cattle farming, *dairy produce* now being supplied to the adjacent industrial areas. Another cattle rearing area is found further north in the *Wear valley* around *Durham*, a town that grew up at a strategic point on the route north, for a bend in the river provided an excellent defensive site.

The Northumberland and Durham coalfield.—This lies on the flanks of the northern Pennines. The area of exposed coal measures lies north and south of the *Tyne*, and this river valley was of importance in facilitating both the exploitation and the *export* of the coal. In very early days coal (called "sea coal") was sent from here to London and it still has a large coastwise traffic. It also exports to the Baltic regions and Scandinavia, just across the North Sea. Modern mining development is leading to the exploitation of the hidden seams that underlie the younger rocks to the east of the Wear.

The coalfield has led to the growth of an industrial region that includes the estuaries of *Tyne*, *Wear* and *Tees*. This is primarily associated with *iron* and *steel*. Iron ore was found in the coal measures and led to some smelting in the Tyne area, but the chief development is at *Middlesbrough*, where the association of iron ore from the Cleveland Hills, limestone from the hills to the north, and coal from Tyneside, all close to tidal water, led to a heavy steel industry, which is now maintained largely by imported ores. The abundant supplies of iron and steel led to a big *shipbuilding* industry along the suitable estuaries of Tyne and Wear. The main centres are *Newcastle*, *Jarrow* and *South Shields* along the Tyne, and *Sunderland* on the Wear. There is also a little shipbuilding at *Hartlepool* to the north of the Tees estuary. The Tyneside industrial area is also noted for *chemicals*, based on coal by-

products, *earthenware*, and various *metallurgical* industries that grew up when the supply of lead from the Pennines was important. In modern times *electrical machinery* is made. Supplies of *salt* in the Tees valley led to *chemical* industries developing there, while *Stockton*

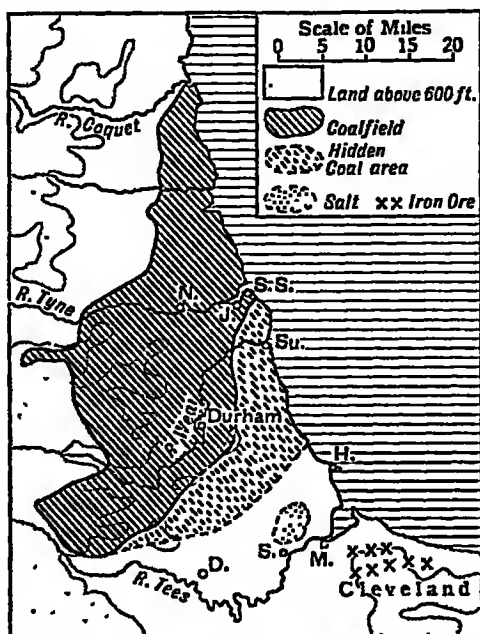


FIG. 173. THE NORTHUMBERLAND AND DURHAM INDUSTRIAL AREA.

and *Darlington* are associated with *shipbuilding* and *locomotive* manufacture respectively.

The main town of the whole coalfield is *Newcastle*, which grew up at a bridge point where the route to the north crossed the river, and it also controls the Tyne gap. The main city is on the high ground, while the industrial developments have taken place along the flood plains bordering the river. It is the main port of the region and imports foodstuffs, pit props and the like from Scandinavia and the Baltic countries.

The West Riding of Yorkshire coalfield.—This is the northern part of the great flank coalfield at the south-east of the Pennines which

is generally known as the Yorks, Derby and Notts field. The southern part of this field has already been considered in the chapter on the Trent valley. The coalfield as a whole stretches from the Aire southward. An important feature in modern times is the development of the hidden seams, which extend eastward, so that mining is no longer confined to the eastern valleys of the Pennines in which it developed, but is found nearly as far east as the Trent.

The Yorkshire area consists of two distinctive regions. One of these is the area of the *Aire-Calder* valleys, which is the centre of the woollen industry, and the other is the area of the *Don* valley, which is the region of coal mining and steel.

The woollen centres have been localized in the Aire-Calder region as the result of a combination of circumstances. Although there were local supplies of wool from neighbouring sheep pastures, it was rather the water supply that led to this region supplanting East Anglia as the centre of the industry. The streams from the Pennines are here of pure soft water, and so are most suitable for cleansing and dyeing purposes. They also provided the original

source of power, so that the factories grew up in the valleys alongside them. With the rise of steam power there was no need for the industry to move, for in these valleys were found the exposed coal measures. The local iron and steel industry also played its part in that it provided raw material for the necessary machinery.

The industry has two main branches. The finer longer wool is used for the superior *worsted* cloth, the poorer quality is used for the heavier *woollen* cloth, some of it for carpets. Generally speaking, the worsted manu-

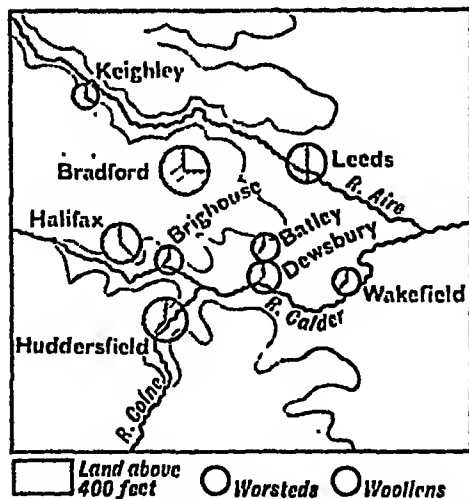


FIG. 174. THE LOCALIZATION OF THE WEST RIDING WOOLLEN INDUSTRY. Mining takes place chiefly in the Calder Valley.

facture is found to the north-west and the woollen to the south-east, but there is no clear-cut division. *Bradford*, *Huddersfield* and *Halifax* are the worsted centres, Bradford also being the big centre for *dyes* and for fine cloths like *alpaca* and *mohair*, while *Halifax* makes *carpets*. *Dewsbury* and *Balley* make *shoddy* from old cloth, and *blankets*. *Wakefield* is now the main centre of mining for this area.

Leeds, which grew up as a market town at the mouth of the Aire-Ribble gap, is the market centre for the industry. It has a big manufacture of ready-made clothes and textile machinery, as well as more general industries, and it is the university centre of the region.

The iron and steel industry of the Don valley originally grew up based on local supplies of iron ore and charcoal, with streams from the hills to provide power for the iron foundries. The waters of the *Sheaf*, which could be used for tempering purposes, and the presence of local material suitable for grindstones, led to *Sheffield* concentrating on *cutlery*, and the skilled labour that developed from this specialization makes *Sheffield* a big centre for advanced metallurgical manufacture of all kinds, and its university a centre of metallurgical research. The heavier steel works are found lower down the Don, near *Rotherham*, while *Doncaster*, a route centre, has *railway machine shops*. In the tributary valley of the *Dearne*, *Barnsley* grew up as the main mining centre, but the mining is gradually moving east to the *Doncaster* district.

The commerce of this region is handled by ports on both east and west coast, and a consideration of the ports of Northern England is left until a later stage.

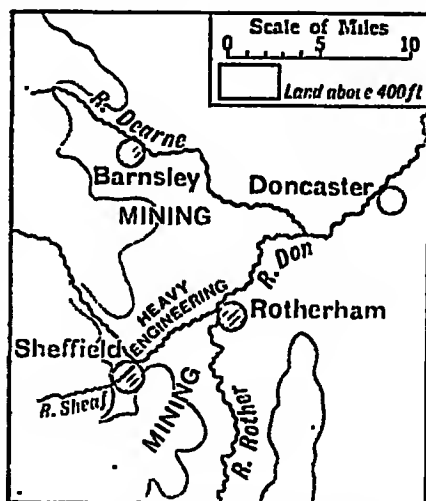


FIG. 175. THE LOCALIZATION OF THE WEST RIDING STEEL INDUSTRY.

Northern England—Western Regions

The western side is much more diversified than the east. It is more rugged, and the lowland areas are isolated regions. Its situation on the west gives it a more humid climate and, as a result, it has much less agricultural development than the east.

The Cumbrian peninsula.—This is a clearly marked region, lying as it does between the inlets of Solway Firth and Morecambe Bay. The central massif, which is generally known as the *Lake District*,

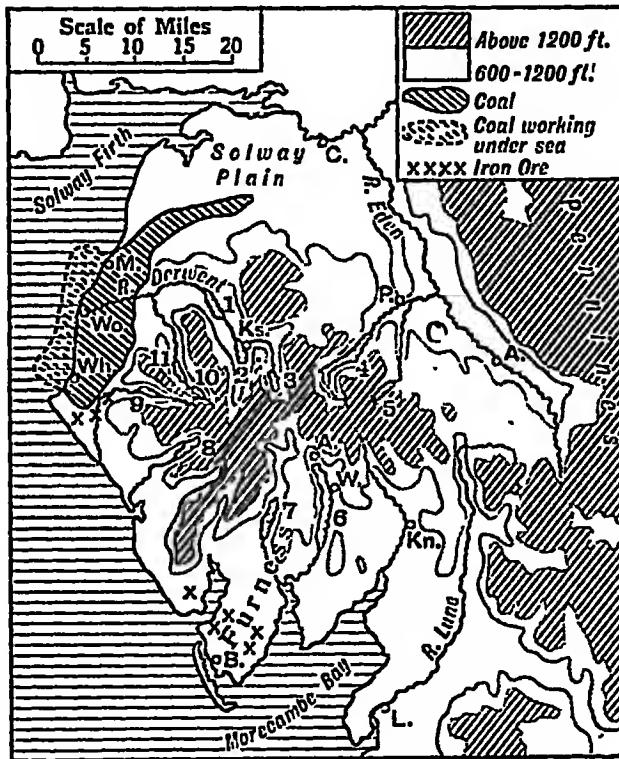


FIG. 176. THE CUMBRIAN PENINSULA.

Lakes :

- | | |
|-------------------|---------------------|
| 1. Bassenthwaite. | 7. Coniston. |
| 2. Derwent Water. | 8. Wast Water. |
| 3. Thirlmere. | 9. Ennerdale Water. |
| 4. Ullswater. | 10. Buttermere. |
| 5. Hawes Water. | 11. Crummock Water. |
| 6. Windermere. | |

was formed by the east-to-west uplift referred to earlier. Its most marked feature is its *dome* formation and the consequent *radial drainage* system. Glacial action resulted in the valleys becoming U-shaped and many of them now contain the long narrow ribbon lakes of glacial formation that form the characteristic feature of the region.

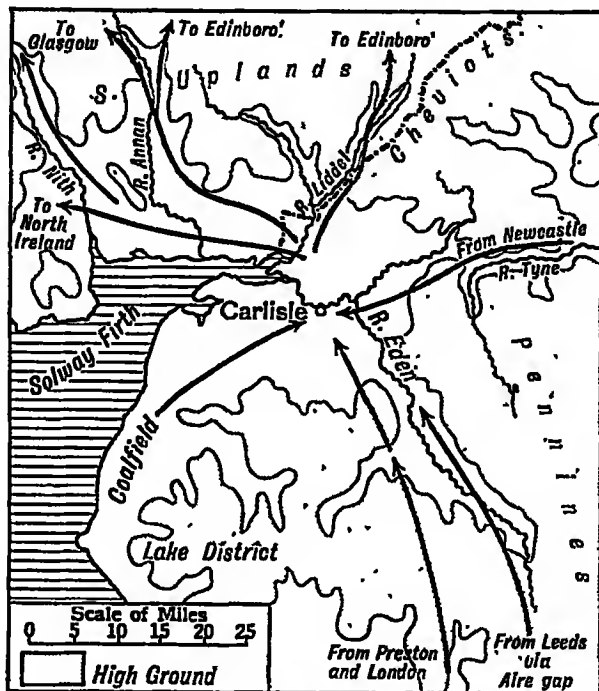


FIG. 177. THE ROUTE POSITION OF CARLISLE.

The heavy rainfall and the structure make it a comparatively infertile area, but *sheep* are reared on the "fells" or upland pastures, and *cattle* are becoming more and more important in the valleys. It is mainly important as a *tourist centre*, being a convenient playground for the thickly peopled industrial areas of Lancashire and Yorkshire. The excessive rainfall is being utilized, for Manchester draws its water supply from *Thirlmere* and is about to utilize *Hawes*

Water as well. *Keswick*, *Windermere* and *Ambleside* are all tourist centres, while *Kendal* still has a small woollen industry.

Flanking the area are two industrial regions. In the south the *Furness district* of Lancashire had rich supplies of *iron ore* and this led to smelting and *shipbuilding* at *Barrow*, but nowadays iron has to be imported.

In the north-west the *Cumberland coalfield* developed along the coast and mines are even extended under the sea. The chief mining and export centres are *Whitehaven* and *Maryport*, the coal being sent to the industrial area of Belfast. At *Workington* local iron ore led to iron smelting, though, owing to the unsuitable nature of local coal, coke was originally brought from the Newcastle area.

The Cumbrian massif is divided from the Pennines by the *Eden valley*, which is composed of young rocks lying in a valley formed by the *Cross Fell* fault, which forms the edge of the Pennines. The *Solway plain* is also made up of young rocks. These two areas are given over largely to cattle rearing, and *dairy farming* is developing to serve both local needs and those of Newcastle.

Appleby and *Penrith* are route and market centres in the Eden valley, but the main centre is *Carlisle*. This town is an old castle centre which has become a modern rail centre, for it controls the routes along the west coast into Scotland as well as the western end of the Tyne gap.

Lancashire lowlands.—South of Morecambe Bay a series of small plains are found in the *Lune valley*, the *Fylde peninsula*, the *Ribble valley* and the *Lancashire plain*. All these have developed farming based on the needs of the nearby coalfields, *vegetables*, *eggs* and *milk* being the main products. *Lancaster*, at the mouth of the Lune, controls the route up the Lune valley and thence to Carlisle, but its place as county town has been taken by *Preston*, situated where the route northward crosses the east-west route via the Aire-Ribble gap.

The Cheshire plain.—This is the most important agricultural area in the west, and is really the north-western portion of the Midland plain, for it is mainly a region of new red sandstone, with glacial soil in places, particularly to the east.

Climate and soil have always led to a concentration on cattle farming, and particularly on *dairy farming*. Cheshire is still noted for its production of *cheese*, but the demands of the Lancashire

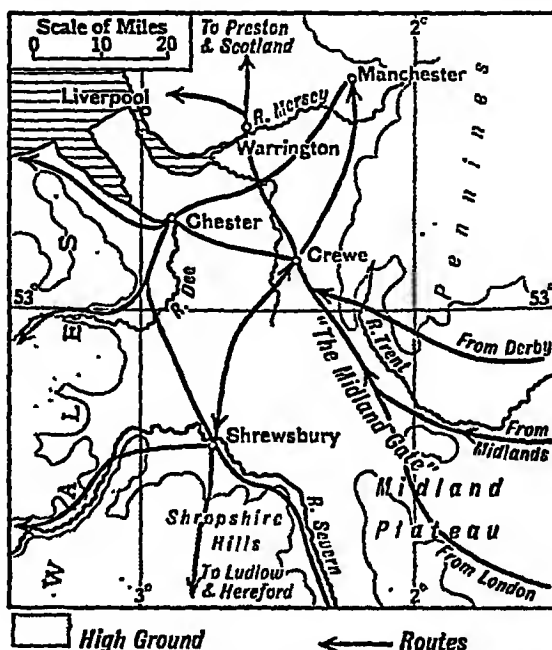


FIG. 178. OLD AND NEW ROUTE CENTRES OF THE CHESHIRE PLAIN AND THE UPPER SEVERN.

Note—(i) how Chester and Shrewsbury control routes into Wales ;
 (ii) the route southwards along the edge of the Welsh uplands ;
 (iii) how Crewe owes its growth to the development of the industrial areas to the north.

industrial area have led to the development of milk supply, and in eastern districts *vegetable* production is of great importance. *Chester* grew up as a port at the lowest bridge point of the *Dee*, and it controlled the route into Wales via the north coast, and southward along the edge of the Welsh highlands. It is no longer a port, and nowadays its route position is diminished owing to the growth of *Crewe*, another railway centre which has developed in an agricultural

area, but also having a route position in the *Midland gate* between the Pennines and the outliers of the Welsh highlands.

The Lancashire coalfield.—This dominates the western side of the Pennines. It lies in what can be called an embayment of the hills to the south of the *Rossendale uplift*. The coal extends across Rossendale, though it has been eroded from two large areas at the centre of the uplift, and there is a smaller field to the south of the Ribble valley. The coal thus surrounds the upper Mersey valley.

The edges of the coal measures here dip steeply under the Cheshire plain, while to the west they are terminated abruptly by a fault, so that there is practically no development of any hidden coalfield. The main mining centres are now found in the south-west, round *Wigan*, *St. Helens* and *Leigh*.

This coalfield is particularly associated with the *cotton industry* which grew up on the foundations of the older woollen and, to a lesser extent, linen industries that developed here alongside the Yorkshire woollen industry. Cotton was first mixed with wool but gradually assumed its present place as the dominating raw material. Local enterprise and invention played a big part in the development of the region, while it was also fortunate in that it had streams from the *millstone grit* giving *soft water*; water-power and subsequently coal to drive its factories; a naturally humid atmosphere, which was a great asset, since cotton yarn snaps when spun in a dry atmosphere; and local supplies of *salt* in the *Weaver valley* of Cheshire to form a raw material for the necessary chemical processes.

There is a very marked degree of specialization within the area. The *spinning* is almost entirely concentrated in the south-east, in the towns of the exposed valleys overlooking the Mersey plain. These towns tend to specialize—thus *Bolton* makes fine yarn from Egyptian and best American cottons, while *Oldham* and *Rochdale* use lower grade American for coarse yarn. *Stockport* specializes in doubling.

Weaving is the main occupation of towns north of Rossendale, as these are too sheltered for spinning, but it is also found in the spinning towns of the south. *Preston* makes sheetings, *Blackburn* and *Accrington* cheap Indian cloths, *Burnley* calico for printing, and

Nelson and *Colne* more fancy materials. *Bury*, in the spinning area, makes *blankets* of wool and cotton mixture.

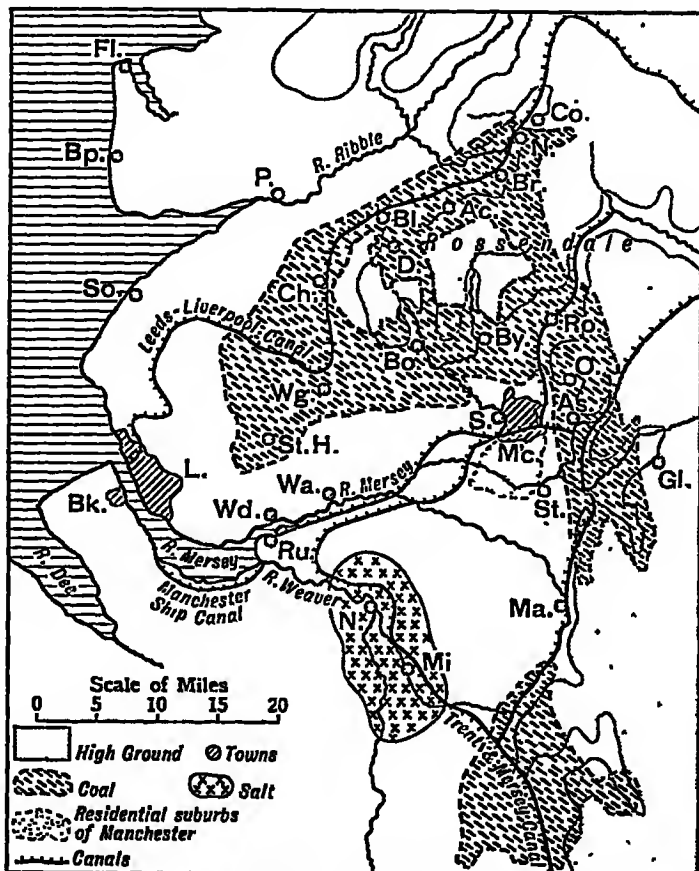


FIG. 179. LANCASHIRE AND CHESHIRE INDUSTRIAL AREAS

Identify the towns.

- Note—(i) the position of the towns in relation to the Rossendale uplift;
 (ii) the areas in the centre without coal;
 (iii) the residential and holiday centres.

The *bleaching*, *dyeing* and *printing* take place largely in the *Manchester* and *Bury* districts. Dyes are made at *Runcorn*, *Widnes*

and *St. Helens*, using chemicals made at *Northwich* from the salt deposits and coal by-products. Associated with these chemical industries are the big *soap* manufactures at *Liverpool* and *Warrington*, which are able to import the necessary animal and vegetable fats from *Argentina*, *Australia* and *Africa*.

Although local supplies of iron were small, this region has become the chief *engineering* centre of the country. It manufactures textile machinery for local and overseas markets, it is the main centre of *electrical engineering*, and it has *locomotive* and *motor* works. The

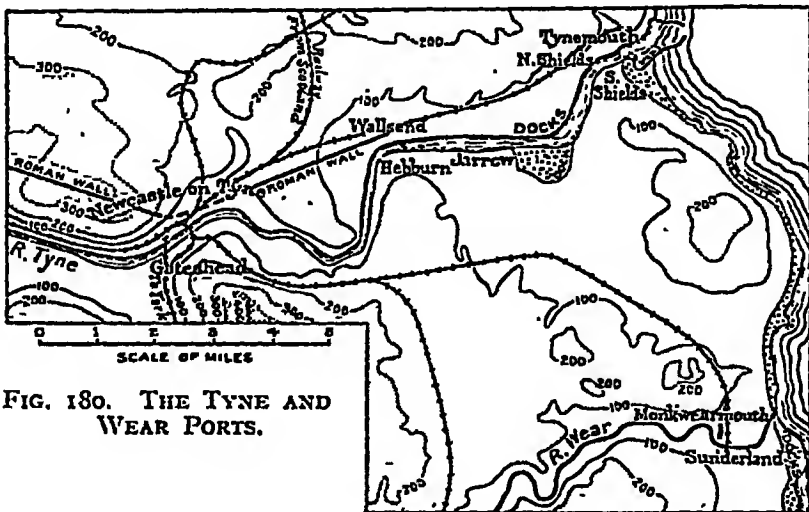


FIG. 180. THE TYNE AND WEAR PORTS.

principal engineering centres are *Manchester* and its twin town of *Salford*, and *Bolton* and *Stockport*.

The metropolis of the region is *Manchester*. This grew up as a market town in the centre of the Mersey plain and is the natural focus of the valleys that open on to that plain. It has thus become the commercial centre for the industries of the region. The construction of the *Ship Canal* to connect it with the Mersey estuary has made it a port. Its residential area is spreading southward and now includes the Cheshire villages across the Mersey, while the coastal towns of Lancashire, such as *Blackpool* and *Southport*, and of *North Wales*, which have grown up as holiday resorts of the coal-field, are the homes of some Manchester business men.

Northern Ports

The ports of Northern England can be divided into three groups. In the north-east are *Newcastle* and its satellites and *Hartlepool*, which have a limited hinterland, serving mainly the Northumberland and Durham coalfield with some trade through the Tyne gap.

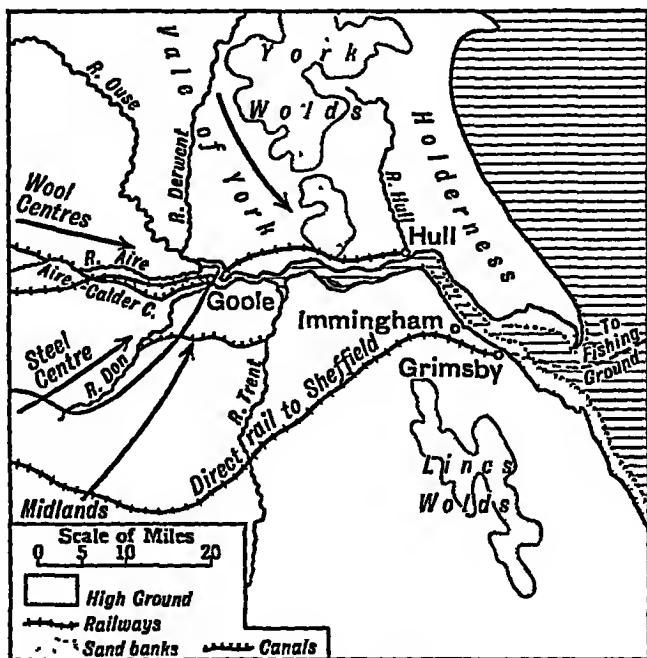


FIG. 181. THE HUMBER PORTS.

The Humber ports are more important. Chief of these is *Hull*. This grew up as the port of Kingston on the little river Hull that entered the Humber on the north. The mouth of this stream is kept comparatively clear of silt by river and tidal currents that sweep by it. It became a fishing port owing to its nearness to the Dogger Bank, and it grew to be important for its *Baltic trade* and makes *ropes* and *oil cake* from hemp and seed imported from Baltic areas. It is the natural outlet for the Yorks, Derby and Notts industrial areas

and for many of the Midland coalfields. It is handicapped by being rather shut off from regions to the south by the Humber.

Grimsby, to the south of the estuary, is the main fishing port of the country, and near-by *Immingham* has been developed owing to the provision of good rail communications to the industrial areas. *Goole*, at the head of the estuary, has grown owing to the development of the *Aire and Calder canal*. It has a considerable coastwise traffic in coal.



FIG. 182. THE MERSEY ESTUARY AND LIVERPOOL.

Note—(i) the immediate hinterlands ;
(ii) the routes to the more distant hinterlands.

The Mersey estuary has given rise to the second largest port of the country—*Liverpool*. As Chester gradually became unsuitable, Liverpool took its place, for the bottle neck of the Mersey keeps the mouth fairly clear of silt. It shared with Bristol the prosperity of the *slave triangle* trade and grew to importance with the Lancashire industrial area. It has easy access to the Midlands via the Midland gate and to Yorkshire by the Aire-Ribble gap. It has developed *soap* and *cattle cake* industries based on imported materials. It was once the centre of the liner and emigrant traffic,

and though much of the former has gone to Southampton, it still has many liners sailing to North and South America. The emigrant traffic is now much less important. The subsidiary town of *Birkenhead*, opposite to it, has shipbuilding industries.

The building of the *Manchester Ship Canal* has made *Manchester* a port. The cotton import trade was too firmly established in Liverpool to be moved to Manchester, and much of its traffic is in newer imports, such as *wheat, timber, fruit* and, more recently, *tea*. The docks are situated in *Salford* and around them has grown a big industrial area based on the transport made available.

With the exception of the Tyneside ports, the hinterlands of the northern ports tend to coincide, and the actual port used by the industrial regions of Lancashire and Yorkshire varies according to the origin or destination of the commodity in question and the shipping facilities that are provided, but Liverpool has by far the largest trade.

EXERCISES ON CHAPTER LII

1. In what respects, and why, does the scenery of Yorkshire differ from that of the peninsula of Cornwall and Devon? (O.S.C.)
2. With the aid of a sketch map or maps, give a reasoned account of the distribution of population in England north of the Trent. (L.G.S.)
3. Describe with a sketch map the location of the coalfields that lie east of the Pennines. Select one of these coalfields and note the character of its industrial development. (L.C.S.)
4. Describe the relief, drainage and human activities of the Pennines (excluding the large industrial areas). (C.W.B.S.C.)
5. Describe the position of the chief cotton spinning towns in the Lancashire area, and from your description deduce the geographical reasons for the localization of the industry in that region. (O. and C.S.C.)
6. Write a brief account of the physical features of the Lake district, and show how they have affected the distribution and economic pursuits of the inhabitants. (O. and C.S.C.)
7. Contrast the textile trade of Lancashire with that of Yorkshire, and state what geographical factors have caused the trades to differ. (C.S.C.)

CHAPTER LIII

WALES

Physical features.—The young rocks of the Severn basin and the Cheshire plain are bounded on the west by the plateau that occupies all the peninsula forming the country of Wales.

This plateau now takes a form that has resulted from the uplift and subsequent erosion of old rock regions that had been peneplained. It shows evidence of two structural systems. North and central Wales, composed of grits and slaty rocks, show structure lines running roughly north-east to south-west. The river valleys that dissect the plateau flow along these structure lines, for they flow in lines of weakness due to softer rocks or to faulting. The highest part is found in the north-west, where *Snowdon* and *Cader Idris* are upstanding because they are formed of more resistant igneous rocks. *Anglesey* is the oldest region but it is now practically a peneplain.

In the south-east the structure lines are connected with the Hercynian folds and run east and west. The *Brecon Beacons*, made of old red sandstone, form the northern edge of this region, and south of them a syncline has preserved a large area of coal measures forming the *South Wales coalfield*. South of the Brecon Beacons the rivers drain to the Bristol Channel, cutting deep valleys in the plateau formed by the coal measures. North of the Brecon Beacons the *Usk* drains a region of old red sandstone that is a continuation of the Hereford area.

The coastal plain is everywhere narrow and the most extensive lowlands are in *Pembroke* and south of the South Wales coal measures, though this lowland, often known as the *plain of Gwent*, is really a continuation of the Severn lowlands.

Its position on the west and its relief give Wales a wet climate

and, although it has no real extremes, the uplands are bleak. The heavy rainfall gives rise to many streams and lakes, and the surplus water is utilized by Liverpool and Birmingham, which draw their supplies from *Lake Vyrnwy* and the *Elan valley* respectively. Water-power is also being developed, more particularly in the north.

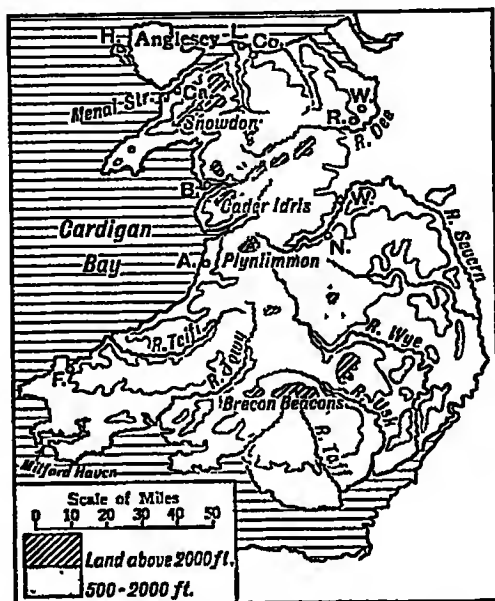


FIG. 183. WALES.

Relief and position of towns (other than those on the South Wales coalfield).

- Note—(i) how river valleys show the direction of the structure lines ;
 (ii) the rivers draining south from the Brecon Beacons ;
 (iii) the entries provided by the Dec and Severn Valleys.

Development.—Farming is almost entirely pastoral. The uplands are some of the chief *sheep pastures* in the British Isles, for the slope mitigates the heavy rainfall. During the bleak winters the sheep are moved down into the valleys.

Cattle are reared in the coastal plains and in the eastern valleys. Anglesey produces a good deal of beef, and dairying is developing

to supply the coast resorts and Lancashire, while Pembroke supplies the nearby coalfield.

The district in the north-west is noted for *slate* quarries, the chief of which are at *Bethesda* and *Festiniog*.

The close proximity of sea coast and mountain scenery has led to the development of a considerable *tourist industry*, and it should be noted that the development of the holiday resorts along the north coast is really linked up with the growth of the industrial area of Lancashire.

The North Wales coalfield.—This represents the outcrop of the seams that dipped under the Cheshire plain on the edge of the Lancashire and North Stafford fields.

It is a comparatively small field and the mining centres are round *Wrexham* and *Ruabon*. There is a small iron smelting trade which uses mainly scrap iron, and *Flint* has *alkali industries* in association with the Cheshire salt area.

The South Wales coalfield.—Lying in a syncline, this is a very good example of a *basin coalfield*. The rivers which flow south-east and south-west from the Brecon Beacons were of great importance in the development of the area, for they cut into the coal seams and so facilitated mining and also provided easy transport routes to the coast. The mining towns, such as *Rhondda*, *Pontypridd* and *Ebbw Vale*, have consequently become concentrated in the valleys, with the intervening uplands still moorlands. The ease of transport caused the area to become particularly associated with export, *Cardiff* and *Barry*, *Newport*, *Swansea* and *Aberavon* being the export centres, so that the present decline in coal export trade has been very severely felt. In the west of the field the coal is *anthracite*, practically smokeless; in the south-east it is the ordinary *bituminous* coal, and between them is found *steam coal*, which has many of the qualities of anthracite.

Iron ore in the carboniferous limestone that surrounds the coal measures led to *iron smelting* at *Dowlais* and *Merthyr*, but now that the industry relies on ore imported from Spain it is carried on almost entirely at the coastal centres at *Cardiff* and *Port Talbot*.

Sheets of steel are coated with tin to form *tin plate* at *Swansea* and

Llanelly, an industry that owed its localization partly to accessibility to Cornish ores, though now the tin comes from Malay, Nigeria and Bolivia. As the steel sheets are dipped in palm-oil after being dipped in the tin (this being done to give a uniform coating) there is also a palm-oil import from West Africa. Swansea also has *copper* smelting and *oil refining*.

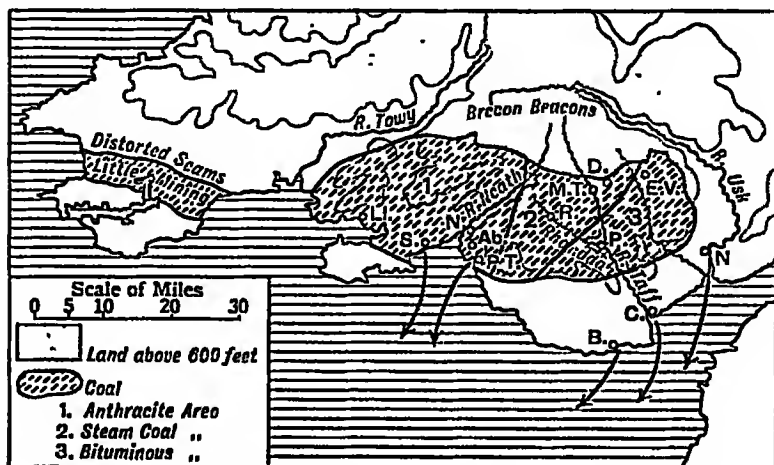


FIG. 184. THE SOUTH WALES COALFIELD.

Identify the towns.

Note the rivers flowing from the Brecon Beacons and the position of the export towns (indicated by arrows).

Towns.—The structure of the country has led to the towns of Wales being scattered around its coasts, and even in the days of its independence it had no central town to form a natural capital. In the north the most important town was the market centre and port of *Caernarvon*, but this has now been outgrown by such holiday centres as *Llandudno* and *Colwyn*.

The main towns of the west coast are *Barmouth* and *Aberystwyth* on Cardigan Bay. *Holyhead*, on Holy Island, is a packet station for Dublin, while *Fishguard*, in Pembroke, built as a packet station for southern Ireland, has also developed as a fishing port.

The towns connected with coalfields have grown up where the route along the plain of Gwent crosses the rivers that drain the coal-field area. Thus there is Newport on the Usk, Cardiff on the Taff, Neath on the River Neath, and Swansea on the Tawe. All these have grown up as export centres and manufacturing towns as the result of the coalfield.

EXERCISES ON CHAPTER LIII

1. Describe and try to account for the distribution of population in Wales. (L.G.S.)
2. Compare Wales with Eastern England as regards (a) the relief of the land, (b) lines of communication, (c) climate, (d) the occupations of the people.
3. Describe the occupations of South Wales and account for their distribution. (O.S.C.)
4. Wales is a country of limited natural resources. Name these resources, and indicate the chief areas in which they occur. Show how the facts you mention have affected the distribution of the population of the country. (C.W.B.S.C.)

CHAPTER LIV

SCOTLAND

Upland Areas

THE northern part of Great Britain is occupied by Scotland, which has formed an integral part of the United Kingdom since the Act of Union.

It is too large and diversified to consider as a whole, and a map shows it to be quite clearly divided into three component areas; the Southern Uplands, which are adjacent to the Pennine area of England, the rugged Highlands of the northern, and an intervening central valley.

The Southern Uplands

Build.—The Southern Uplands are a dissected plateau of material similar to that forming the Welsh uplands. They also show a structural system running from north-east to south-west. Generally speaking the uplands have rounded surfaces, with the rivers flowing in deep valleys, which show signs of glaciation. The highest regions are found towards the west, where igneous rocks lead to more rugged outlines. In the west the main drainage is to the Solway Firth, but in the east the *Tweed* drains eastward over the lowest and least rugged part of the region.

Development.—There is a difference in occupation between west and east. The exposed western areas have a heavy rainfall and, in consequence, the lowland pastures are devoted largely to *cattle* rearing. The less rugged and drier eastern area is important for *sheep rearing*. This is particularly so in the lands immediately adjacent to the *Tweed*, for the lowlands of that river can be utilized for growing winter fodder crops as well as *oats* and *barley*. The

dense sheep population and the supply of running water led to the establishment of a *woollen* industry centring mainly on *Hawick*, *Galashiels* and *Selkirk*, and this still manages to survive despite the intense competition of the bigger woollen industries elsewhere.

The main town of the Tweed valley is *Berwick*, which is actually situated in England. In the west the chief towns are the route and market centres situated on the *Solway plain* opposite the outlets of

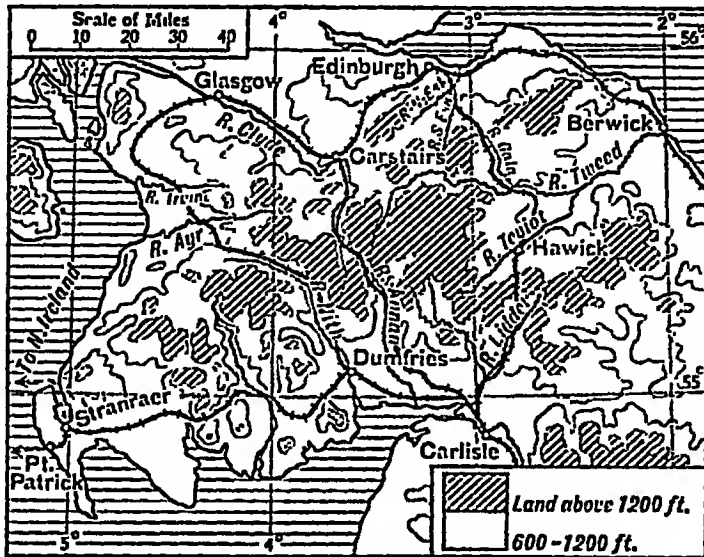


FIG. 185. THE SOUTHERN UPLANDS.

Note control of routes by relief.

the main dales leading into the uplands, viz. *Dumfries*, *Kirkcudbright* and *Newton Stewart*. *Stranraer*, on Loch Ryan, and *Port Patrick*, on the extreme west of the peninsula known as the *Rhinns of Galloway*, are packet stations for the Northern Ireland towns of *Larne* and *Donaghadee* respectively.

It should be noted that the Southern Uplands lie athwart the routes leading from England to the commercial regions of Central Scotland. Hence routes across the area have to use natural features, and the way in which they do so, as shown in Fig. 185, is an interesting example of route control by relief.

The Highlands

Build.—The Highlands are the oldest area of the British Isles and their formation is associated with the *Caledonian* movement, which was also responsible for the Scandinavian highlands.

The folds associated with this movement took place so long ago that the area has been worn down and, following a further uplift, is now in process of being worn down again. It is thus another dissected plateau, but, since it is composed of hard and resistant *igneous* and *metamorphic* rocks, the scenery is particularly rugged. It has been much influenced by faulting and glaciation. The region as a whole is cut into two by the rift valley of *Glen More*, running from the *Moray Firth* to *Loch Linnhe*, while the numerous sea lochs form a fjord coast on the west, and the many deep inland lochs are generally ascribed to the combined effect of faulting and glacial action.

North of Glen More is the region of the *North-West Highlands* which are intensively cut up by lochs. South of Glen More lie the *Grampian Highlands*. In these lies a belt of very hard granite which has given rise to the highest peaks of the country. In the west *Ben Nevis*, the highest, is isolated, but in the east the *Cairngorm* district includes four peaks of over 4,000 feet.

To the east the highlands gradually sink, and round the *Moray Firth* there are lowlands made of old red sandstone, and these continue northwards to *Cairnness* and the *Orkney Islands*.

The easterly peninsula between the *Spey* and *Don* rivers is a peneplain of old rocks often known as the *Buchan sill* or peninsula.

The rivers cut deep valleys and a definite pattern can be observed, for they either run as consequent streams in a south-easterly direction or at right angles to this in valleys cut in the softer rock layers along the structure lines running north-east to south-west.

Development.—The western area, in addition to being much the more rugged, has a very wet climate, and as it has little soil there is very little development, and the natural scantiness of population has been accentuated by the conversion of large areas to sporting estates. Small farmers, known as "crofters", manage to grow *oats*

and *root crops* in the valleys and pasture *sheep* and *cattle* on the hills, while along the coast *fishing* is possible.

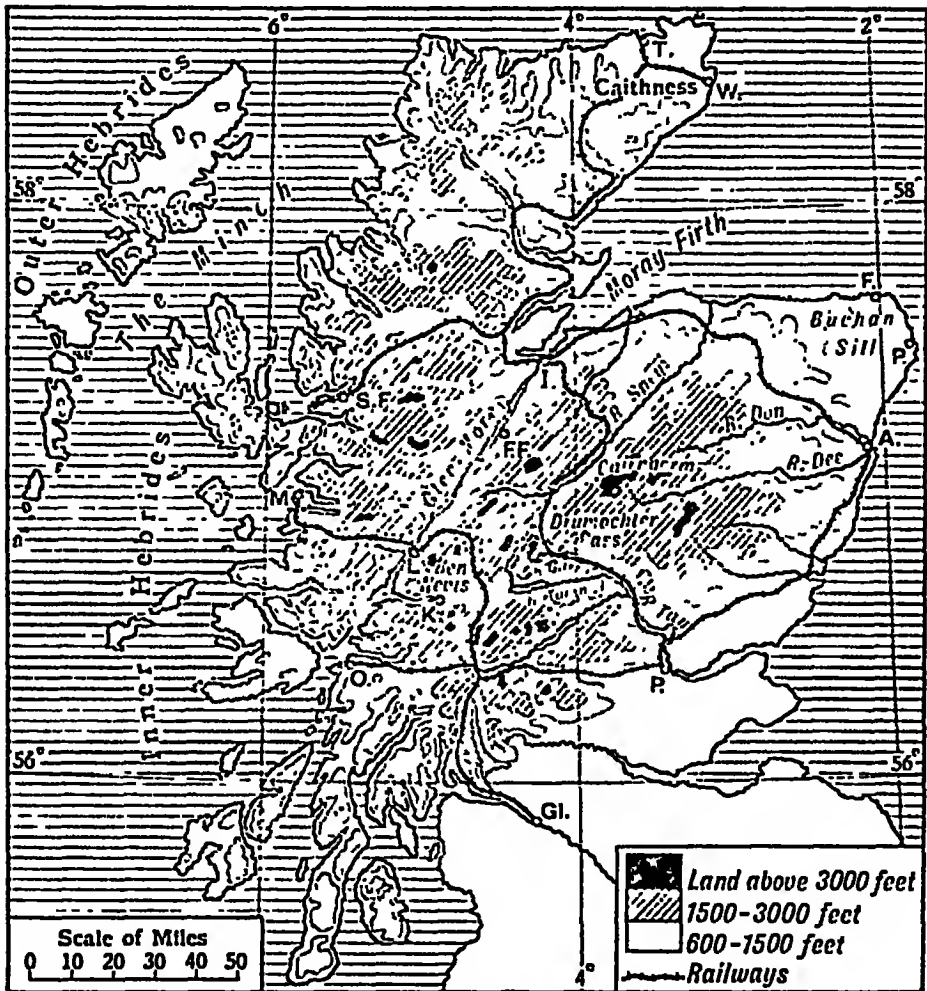


FIG. 186. THE HIGHLANDS.

Note—(i) the routes to Inverness ;
(ii) the routes to the west coast.

The eastern lowlands are more fertile and productive. Oats and barley can be grown, and there is a considerable cattle rearing industry. Fishing is more important than on the west coast, for

the coastline faces the fishing grounds of the North Sea and Dogger Bank. Consequently all the important settlements are along the east. Chief of these is *Aberdeen*, which controls the routes on to the Buchan peninsula, and has easy access to the Highlands by the Don and Dee valleys. It is a big fishing centre.

Inverness, at the head of the Moray Firth, controls the route through Glen More, but the comparative unimportance of that route, and of the *Caledonian canal* which follows it, is reflected in the small population of the city despite its ideal site for growth.

Peterhead and *Fraserburgh* are North Sea fishing ports on the Buchan peninsula, while *Wick* and *Thurso* are the main fishing ports of Caithness.

On the west coast *Oban* is a fishing and tourist centre and *Mallaig* is a port for the Hebrides. It should be noted that there is no railway along the west coast, for it is served by lines crossing from the east.

A recent development has been the utilization of *water-power*. This is being used for the extraction of *aluminium* at the *Falls of Foyers* at Loch Ness, and at *Kinlochleven* and *Lochaber* on the west. The river *Tummel* generates electricity which supplies the central valley.

The Islands.—Lying off the coast are groups of islands linked up with different structural areas. The *Orkneys* are a detached part of the old red sandstone area, cut off by the dangerous *Pentland Firth*, through which there are strong tidal currents. They are mainly important for fishing, the chief town being *Kirkwall*.

The *Shetlands* consist of old hard rocks, like the north-western area. Sheep and ponies are reared and *Lerwick* is a fishing centre.

Off the west coast lie the Hebrides. The *Inner Hebrides* stretch from *Skye* to *Islay* and are interesting because of the sheets of volcanic *basalt* that are found in them and which lead to many famous scenic features, such as Fingal's Cave. Beyond the *Minch* lie the *Outer Hebrides*, which are much worn down patches of old rock. The crofters rear sheep and the islands are famous for their home-spun and home-dyed "Harris tweeds". There is also a considerable fishing industry centred on *Stornoway*, the fish being sent to

Strome Ferry, though much of the fishing in this area is now carried out by big trawlers that come from Fleetwood in Lancashire.

Lowland Areas

Build.—The central valley, or as it is sometimes called, the Central Lowlands, lies between these two areas of uplands. Structurally it is a *rift valley*, for its northern boundary is marked by a fault line—the *Highland line*, running from *Stonehaven* on the east to *Helensburgh* on the west, while its southern boundary is also a fault line, rather less clearly marked, running from *Dunbar* on the east to *Girvan* on the west and known as the *southern boundary fault*. It will be seen that both these lines follow the prevalent north-east to south-west structural line. This direction is also followed by a line of hills of igneous formation which are separated from one another by river valleys. These are the *Sidlaw Hills*, *Ochil Hills*, *Campsie Fells* and *Lennox Heights*, and the *Renfrew Hills*.

North of these hills lies the broad lowland of *Strathmore*, which is a region of old red sandstone, with the Grampians forming a rampart of old rocks to the north of the Highland line.

South of these hills the region is more irregular and rises gradually to the southern uplands. The rocks belong to the carboniferous period, and contain important coal deposits, but intrusion of igneous material and other disturbances have prevented these coal measures from being continuous.

The main drainage of the area is by the *Tay* and *Forth* river systems which flow across the area from the Highlands to the east, but in the western districts the *Clyde*, *Irvine* and *Ayr* drain westwards from the southern uplands.

Development.—As in the rest of Scotland, the climatic difference between west and east coast is quite marked, and this has a consequent effect upon agriculture. This was always the main region of Scotland, being a rich farming area before it developed its present industrial life.

On the west cattle farming is predominant, particularly in Ayrshire and in the Clyde valley, and this is now mainly *dairy farming*

to supply the wants of the industrial areas. The hills of the region provide *sheep* pastures.

On the east arable farming is more important. Strathmore grows *barley*, which is used for *brewing* and *distilling*, while the low-

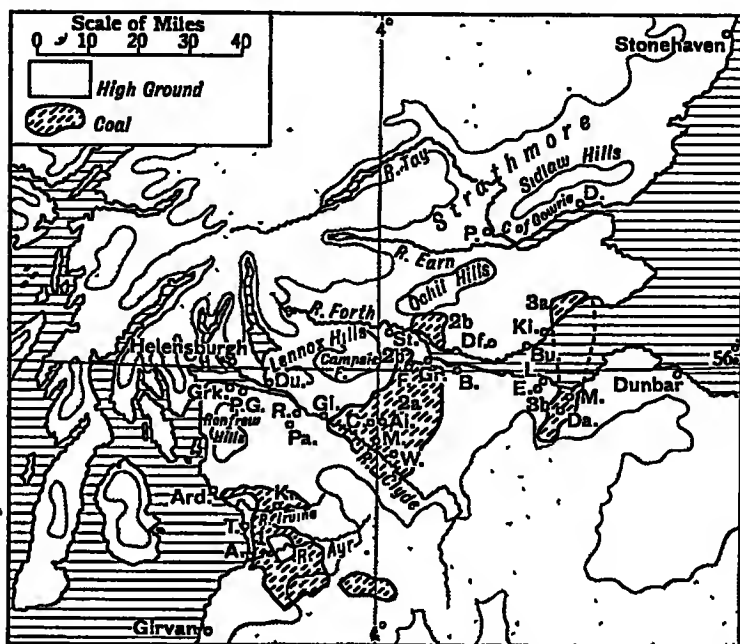


FIG. 187. CENTRAL SCOTLAND.

Identify the towns.

Trace the boundary faults and note the north-east to south-west trend.

- Coalfields :**
1. Ayrshire.
 2. a. Lanark.
b. Stirling and Clackmannan.
 3. Firth of Forth.
a. Fife.
b. Lothian.

lands near the Forth produce *wheat* and *barley*, with *sugar beet* a more modern crop. The sheltered *Carse of Gowrie*, between the Firth of Tay and the Sidlaws, is the chief *fruit* growing region of Scotland.

The coalfields lying south of the igneous hills fall into three

basins: the Ayrshire on the west coast; the Central or Lanark, Stirling and Clackmannan, stretching from the Clyde to the Ochils; and the Firth of Forth coalfields, which are divided into the Fife and the Lothian fields by the Forth (see Fig. 187).

The Ayrshire field.—Situated on the coast, this has developed mainly an export trade, coal being exported from *Ayr*, *Troon* and *Ardrossan* to Northern Ireland. There is very little industrialization. *Kilmarnock*, the main centre, has an *engineering* industry which once used local iron ore, and a *carpet* industry that is a survival of a once important woollen industry that thrived in the Irvine valley.

The Central field.—This produces half of Scotland's coal. There is a certain amount of export via the Clyde, and some is sent eastward via the *Forth-Clyde canal*, by which *Grangemouth*, on the Forth, serves this coalfield.

Local iron ores, now largely replaced by imported supplies, led to the growth of the *iron and steel* industry which is found at *Coatbridge*, *Airdrie*, *Motherwell* and *Wishaw*.

This iron and steel, together with the enterprise that led to the deepening and improving of the shallow Clyde, were responsible for the growth of the Clydeside *shipbuilding* industry, which is carried on along the banks of the Clyde from *Glasgow* to *Greenock*; *Port Glasgow*, *Dumbarton* and *Renfrew* being big centres. With this has grown up a big *engineering* industry centred mainly on Glasgow itself.

Climate, local water supplies and easy access to America gave rise to a cotton industry, but, with the exception of *cotton thread* at Paisley, this has not survived the competition of the better organized Lancashire industry. *Greenock* has *sugar* refineries, while *chemical* works at *Dumbarton* have aided the growth of the manufacture of *artificial silk*.

The small *Stirling and Clackmannan* field has iron smelting at *Carron* near *Falkirk*, and there is export from *Bo'ness*.

The Fife coalfield.—This has a large *export* trade to the Baltic and north-west Europe, the main ports being *Methil* and *Burntisland*. This region was the seat of the *linen* industry in early days of Scottish industrialism, and is still important. It is carried on at *Dunfermline*

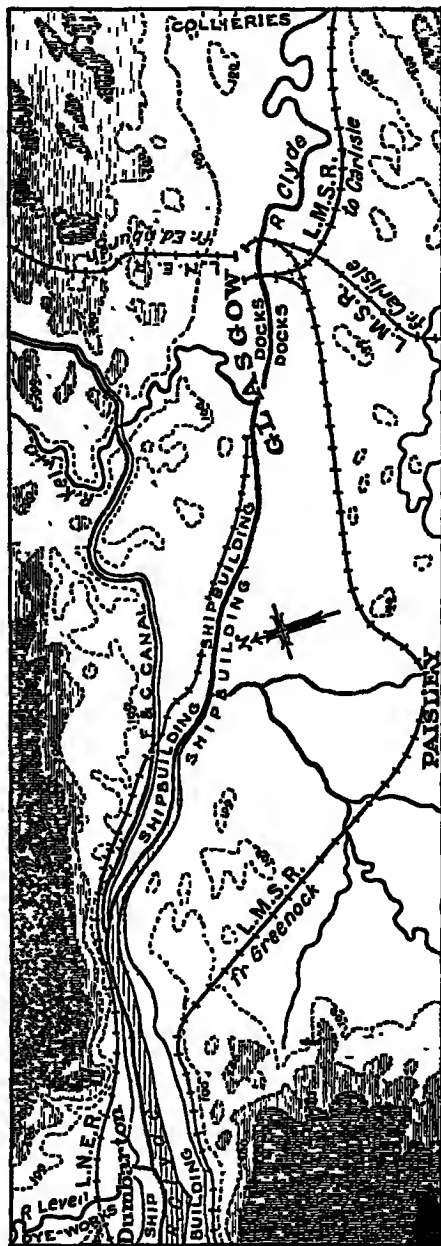


FIG. 188. THE CLYDE NEAR GLASGOW.

Scale—3 miles to an inch. Contour lines are numbered.

and *Kirkcaldy*, the former also making *paper* and the latter *linoleums*. The main industrial town connected with this field is *Dundee*, situated to the north of the Firth of Tay. It has big linen industries and it is the main centre of the *jute* industry, the old *whaling* industry providing an oil that proved of value in softening the fibres. Its *jam making* industry has developed owing to the fruit growing of the Carse of Gowrie.

The Lothian coalfield.—This is situated in the valley of the Esk, the chief mining centres being *Dalkeith* and *Musselburgh*. The coal is used for the *engineering*, *paper* and *brewing* industries of *Edinburgh* and *Leith*, there being some export from the latter.

Towns.—Towns in this region have grown up at route centres. *Edinburgh*, the capital, is at a meeting point of the route from the south and the Tweed valley with that across the lowlands from Glasgow. It grew up as capital when Scotland's main connections were with the Baltic and the continent.

Glasgow, now second in size to London, has a central position in the western areas, and has grown with the Lanark coalfield and the development of trade with America.

Stirling and *Perth* grew up at nodal points, where the Forth and Tay make gaps between the igneous hills. *Stirling* was once a capital city but is now mainly important as a route centre. *Perth* is a market centre for a considerable district.

EXERCISES ON CHAPTER LIV

1. Write an account of the textile industries in the Midland Valley of Scotland, showing the sources of the raw materials, and the local geographical conditions that have affected their development.

(O.S.C.)

2. Show how the density of population in Scotland is affected by the physical structure, climate, and natural resources of the country.

(O.S.C.)

3. Draw a sketch map of the Southern Uplands of Scotland. Indicate and name on the map three important river valleys.

Explain (a) why the river valleys are important, (b) why the occupations in the eastern half differ from those in the western half of the region.

(C.S.C.)

4. Draw a sketch map to show the relief and drainage of the Clyde basin, and indicate the distribution of human activities within the basin. (L.C.S.)
5. Discuss in detail the causes influencing the distribution of population in the Midland Valley of Scotland. (S.L.C.)
6. Compare the east and west coasts of Scotland north of a line from Forth to Clyde, as to climate, products and occupations of the inhabitants, and account for the differences between them. (S.L.C.)
7. Describe and account for the distribution in Scotland of the following: (a) cattle, (b) sheep, (c) cereals. (C.S.C.)

CHAPTER LV

IRELAND

Position and build.—Lying to the west of the main island of Great Britain, Ireland is separated from it by the Irish Sea, with the North Channel lying between it and Southern Scotland and St. George's Channel between it and South Wales.

Structurally it shows links with many parts of the main island. In build it is unlike it, since its mountains are essentially peripheral, but they are not continuous, and do not all belong to the same system.

In the *north-west* the mountains of *Tirconnair* (*Donegal*) represent a continuation of the Highlands of Scotland, which are further continued in the peninsulas of *Mayo* and *Connemara*. In the *north-east* the *Mourne Mountains* form a continuation of the Southern Uplands. Between these two areas is a region unlike the central lowlands of Scotland, for vast basaltic lava sheets form the *plateau of Antrim*, which is steep towards the east coast but sinks westward to form the basin of *Lough Neagh*.

In the *south-east* the *Wicklow Mountains*, which have a granite core, and the *Wexford Hills* are linked structurally with Wales.

Southern Ireland forms the western end of the Hercynian fold system, and consists of a series of ridges and valleys, mainly of

Devonian material, running roughly east and west, with river valleys flowing along structure lines. In the west the land has sunk to form a series of rias, *Dingle Bay*, *Kenmare river* and *Bantry Bay*.

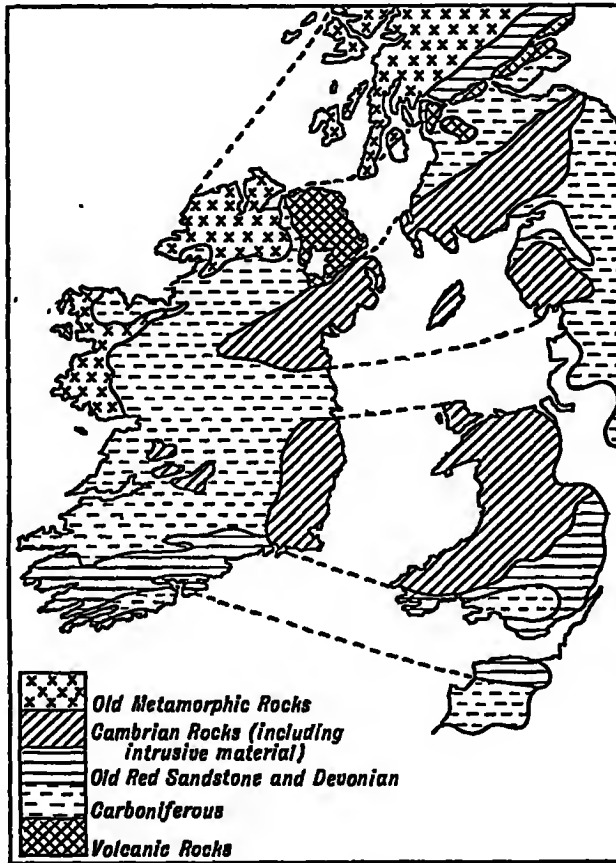


FIG. 189. IRELAND.
The structural links with Great Britain.

Central Ireland consists of a great *plain* formed of almost undisturbed sheets of carboniferous limestone, covered over in many places with much glacial material. The clayey glacial material and the poor drainage have resulted in the formation of great *bogs*, while the rivers, flowing slowly over the region, form lakes, either owing

to natural glacial dams or to the solution of the limestone forming broad hollows.

The main river of this region is the *Shannon*, the longest river in the British Isles, which flows from north to south across the plain and then west into the Atlantic.

Climate.—Its western position gives Ireland a markedly *oceanic climate*. It has a very small temperature range, particularly on the west, and it has a considerable rainfall, the absence of any marked mountain barriers leading to this rainfall being well distributed. This mildness and humidity are reflected in its vegetation, the freshness of its grasslands having earned for it the name of the "Emerald Isle".

Development.—Since 1922 it has been divided into two. The greater part of the island forms the Irish Free State, now officially styled "Eire", a completely self-governing dominion, while in the north six counties form Northern Ireland, which is still a direct partner in the United Kingdom. This area represents a region of very different history and development and can be treated separately.

Northern Ireland

Northern Ireland is the region that was mainly developed by Scots and English settlers. It has a fairly sheltered position and a drier climate, so that agriculture is more certain. The chief area is round *Lough Neagh* and in the valley of the *Bann*.

Oats is the main cereal, and cattle are reared for *beef* and for *dairying* purposes. The typical crop of the region is *flax*. This requires a good soil, but more particularly it requires a moist temperate climate and needs water containing bacteria for the process of separating the fibres from the stem of the plant (retting). All these conditions are present. This has led to a local *linen* industry, now using imported coal, the main centres being *Belfast*, *Lurgan* and *Londonderry*.

There is a small coalfield near *Dungannon*, but it produces very small quantities. A certain amount of *aluminium ore* is found and is sent to the Scottish smelting centres.

Towns.—The chief town of the region is *Belfast*, which has a good site on *Belfast Lough*, and easy communication via the *Lagan*

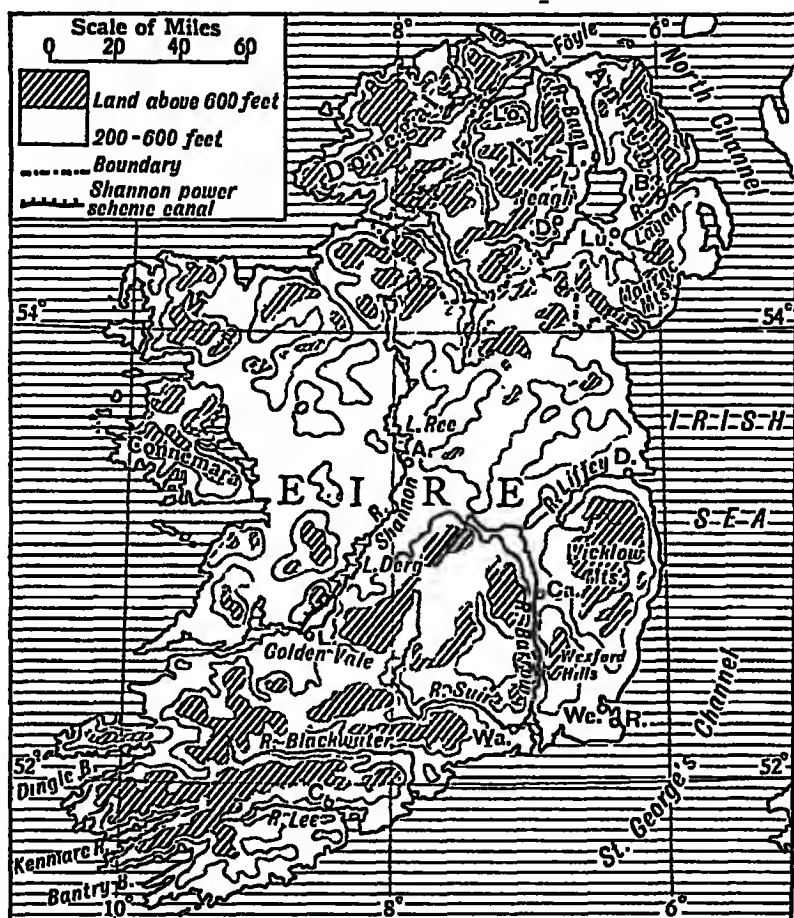


FIG. 190. IRELAND.

Identify the towns.

Note the large proportion of low land.

valley to the Lough Neagh region, while it faces the industrial regions of Scotland and Lancashire. It has a large *shipbuilding* industry which grew up mainly owing to cheap land and good launching facilities, all the raw materials having to be imported.

Londonderry, at the head of Lough Foyle, serves the northern part of the region, but much of its natural hinterland now lies across the frontier of the Free State.

Eire

The central and southern portions of Ireland, which form the Free State, are essentially regions associated with cattle pastures. The climate is too wet for much cereal growing, save to the east and in some of the sheltered valleys of the south.

Cattle are reared for *beef* over much of the area, and particularly so in the eastern part of the plain behind *Dublin*, for from here they can easily be shipped to their natural market in England.

Dairy cattle are found particularly in the *Golden Vale of Limerick* and *Tipperary* and in the district behind *Cork*, where co-operative creameries have been established to deal with the milk produced.

Sheep are not much reared, the only area where they play any real part being in the western mountain districts, Galway and Donegal both producing home-spun tweeds.

Linked up with the cattle rearing and dairy farming is *pig rearing*. The pig plays a large part in a land of small farms as it is a cheap form of livestock. Consequently, with the aid of co-operative factories, there is a considerable export of *bacon*.

The only cereal grown to any extent is *oats*, and this is grown in the better drained areas surrounding the plain, rather than in the central plain itself. *Barley* is grown in some eastern areas, particularly near Dublin and in Wexford, and gives rise to brewing and distilling industries.

A special feature of Ireland is the big production of *potatoes*. The potato thrives in the moist, humid conditions, and forms a very valuable staple human food while the surplus can be used as a food-stuff for cattle and pigs.

Although Ireland has large areas of rocks of carboniferous age, it has practically no *coal*, the only field of any size being near *Carlisle*, in South Ireland.

To make up for this the *Shannon power scheme* has been developed. Just after leaving *Lough Derg* the Shannon falls rapidly, and the

head of water thus provided is taken by a canal to a power station just above *Limerick*. Sufficient power can be generated to provide an electric grid system to supply all the Free State, and it is of great use in a region where dairy farming is a main occupation.

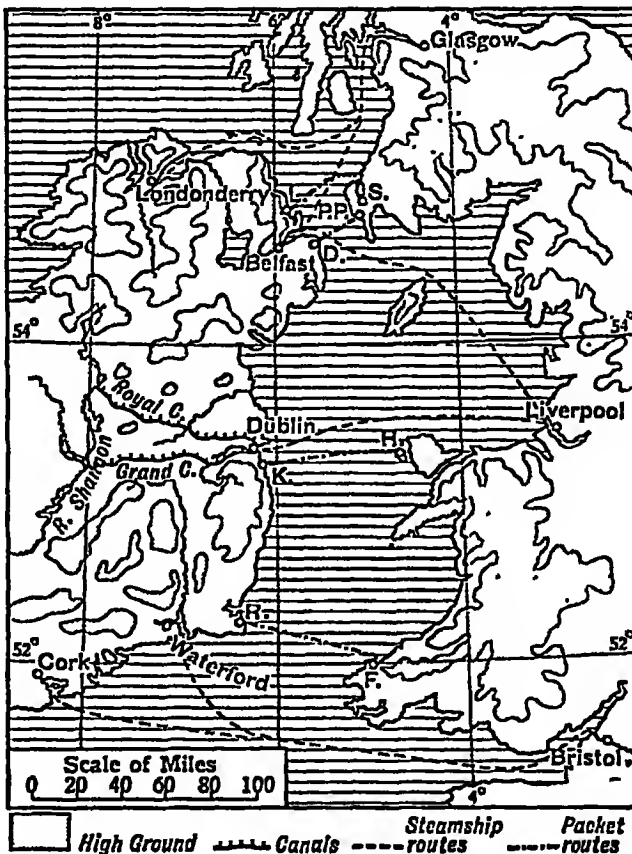


FIG. 191. THE IRISH PORTS.

Identify the packet stations.

Note the central position of Dublin.

Towns.—The main towns occupy coastal positions, and the two most important face towards Great Britain.

Dublin, in the centre of the east coast, is at the obvious site for the main town. The central plain here extends to the coast, and this natural route is followed by railways and by the *Royal* and *Grand*

canals linking it to the Shannon. Dublin Bay provides a good harbour facing Liverpool, so that it is splendidly situated for trade with England. It thus naturally grew to be the capital of the country.

Cork is situated on a good harbour on the south, and serves the fertile districts of the south and is the outlet for the Golden Vale. It faces the Bristol Channel, and so has a good entry into England for its trade.

Waterford and *Wexford* are small ports, but are of no great importance, *Rosslare*, the packet station, dealing with most of the trade of the south-eastern corner.

Limerick has a good site, but it faces out on to the Atlantic and, as little trade goes that way, it is of little importance.

The only important centre in the plain is *Athlone* where the main east-to-west route—from Dublin to Galway—crosses the Shannon.

EXERCISES ON CHAPTER LV

1. Compare the Central Plain of Ireland with either the Lowlands of South Lancashire and Cheshire, or the Central Lowlands of Scotland with regard to (a) characteristic farming activities, (b) power resources, (c) industrial activities and density of population. (J.M.B.S.C.)

2. Show how the density of population in Ireland is affected by the physical structure, climate, and natural resources of the country.

(O.S.C.)

3. Describe the occupations of Ulster and account for their distribution.

(O.S.C.)

4. Name and describe shortly three steamship routes from Great Britain to Ireland, naming the terminal ports in each case. State, with reasons, the chief kinds of traffic carried on by the routes selected.

(S.L.C.)

5. Write an account of the relief and drainage of Ulster, and show how these facts have affected the position of the ports and the means of communication within the country.

(O.S.C.)

6. Write a geographical description of the Shannon basin under the following heads: (a) characteristics of the river, (b) appearance of the countryside, (c) occupations of the people.

(L.G.S.)

7. Describe and account for the distribution in Ireland of the following: (a) cattle, (b) sheep, (c) cereals.

(C.S.C.)

REVISION EXERCISES ON THE BRITISH ISLES

1. "Many of the surface features of the British Isles are due to the action of ice." Explain and illustrate this statement. (O.S.C.)
2. Give a brief account of the distribution of iron in Great Britain. Name three sources from which iron ore is imported on a large scale into Great Britain. With the aid of a sketch map, describe how the iron smelting industry arose, and has persisted, on the Tees estuary. (J.M.B.S.C.)
3. Select three of the following industries and indicate for each one area in the British Isles where it is carried on. State clearly the conditions favouring the development of each of the three, and name the chief centres: chair-making, sugar refining, linen manufacture, tin plating, hop production, glass manufacture, slate quarrying. (O.S.C.)
4. Select three areas from the British Isles, each with a different type of soil. Describe, and give reasons for, any differences in vegetation, both natural and cultivated in the three areas. (O.S.C.)
5. Name three ports in Great Britain which are largely concerned with the export of coal. Describe their position and their relation to the coalfields which they serve. What other industries have centred round each coalfield? (C.S.C.)
6. Give a reasoned account of the type of farming in three of the following: Kent, Cheshire, Hereford, Fife, Kerry. (L.G.S.)
7. Discuss the advantages and disadvantages which Great Britain possesses as (a) a wheat growing country, (b) a cattle raising country. (L.G.S.)
8. What main factors influence the localization of industries? Illustrate by a careful account of two examples. (S.L.C.)
9. Write a geographical account of the British sea-fisheries, explaining the location of the fishing grounds. Mention the chief fishing ports, and give reasons for their relative importance. (S.L.C.)
10. Which parts of the British Isles are important for (a) sheep rearing, (b) cattle rearing, (c) market gardening? State the geographical factors which determine the distribution of these occupations in our islands. (J.M.B.S.C.)

REVISION QUESTIONS

1. What do you consider to be the *three* chief factors that influence the climate of a country? Give your reasons. Illustrate your answer by reference to one of the following : (a) The British Isles, (b) British Columbia, (c) Natal, (d) Japan. (C.S.C.)

2. What are the chief geographical factors which determine whether the natural vegetation of an area is (a) grassland, (b) forest or (c) desert? Illustrate your answer by examples from either Africa or Australia. (O.S.C.)

3. (a) Name two Equatorial Lowland regions. (b) Describe briefly their climate with regard to (i) temperature, (ii) rainfall. (c) Explain briefly why even in the interior of continents in Equatorial lowland regions there is a small mean annual range of temperature. (d) Name one large equatorial highland and compare it with the equatorial lowlands named with regard to its temperature and its mean annual range. (e) State three characteristics of the trees of equatorial lowland forests, and show briefly how they are related to the climatic conditions. (J.M.B.S.C.)

4. Show that the search for mineral wealth has played an important part in the exploration and settlement of new lands. (S.L.C.)

5. Choose two important fruit-growing areas, which are situated in very different climatic regions. Name the chief fruits produced, and account for the development of fruit-growing in each of the areas chosen. (J.M.B.S.C.)

6. Contrast, from a geographical point of view, human activities in a monsoon country such as India with those in a region of the southern hemisphere with a Mediterranean type of climate such as the south-west of Cape Colony or the south of South Australia. (S.L.C.)

7. What are the conditions of production, and of entry into world commerce, of two of the following : (a) gold in Yukon, (b) coal in Pennsylvania, (c) nitrates in Chile, (d) iron ore in Sweden? (C.S.C.)

8. Select two of the following crops : (a) oil palm, (b) coffee, (c) grape vine, (d) sisal hemp.

For each crop chosen, mention two regions important for its production, and describe the conditions which favour its growth. (C.S.C.)

9. Choose any two of the following, and give an important example of each : (a) a karst area in temperate latitudes ; (b) a coastal mountainous area of abundant rainfall ; (c) a tropical grassland ; (d) a desert oasis. Describe the chief features of the life and work of the inhabitants of the two chosen, and show to what extent these are determined by the geographical conditions of their environment.

(O.S.C.)

10. Compare either wheat cultivation in Canada with wheat cultivation in the Punjab ; or cotton cultivation in the United States with cotton cultivation in Egypt.

(S.L.C.)

11. Select two of the following : the Deccan, Southern Africa, Spain, Scandinavia, the Canadian Shield.

For the pair you choose point out the principal differences in (a) relief, (b) climate, (c) products, (d) occupations of the people.

(C.W.B.S.C.)

12. Describe the most important geographical features of one of the following regions, and show how they have affected the mode of life of the inhabitants : (a) the Canadian Prairies, (b) Greece, (c) the Hwang-Ho basin.

(O. and C.S.C.)

13. Sheep are bred on a large scale in (a) England, (b) New South Wales. Compare the geographical conditions and the purposes for which the sheep are bred in these two countries.

(C.S.C.)

14. Describe the physiographic features of the Alps and contrast them with the Rocky Mountains.

(O. and C.S.C.)

15. Describe the geographical conditions which have aided two of the following : (a) shipbuilding on the banks of the Tyne, (b) the manufacture of linen goods in Northern Ireland, (c) the manufacture of woollen goods in the Tweed Valley.

(C.S.C.)

16. What are the chief geographical factors which have helped to make (a) Devonshire a tourist centre, (b) West Ireland a cattle country, (c) Hull an important centre of the oil seed industry?

(O.S.C.)

17. From what parts of the Empire does Great Britain obtain large supplies of wheat and butter? Under what conditions is each of these produced?

(C.S.C.)

18. From what parts of the Empire does Great Britain obtain supplies of vegetable oils, and of wool? Under what conditions is each of these produced?

(C.S.C.)

19. From what parts of the Empire can Great Britain obtain supplies of raw cotton, and of rubber? Under what conditions is each of these grown?

(C.S.C.)

20. Outline the course followed by a steamer from Tilbury (London) to Sydney. Name four chief ports of call, and describe the commerce of each port.

(C.S.C.)

21. What geographical factors have led to the growth of two of the following towns: Melbourne, Trieste, Singapore, Buenos Aires, Alexandria? (O.S.C.)

22. Illustrate the influence of geographical factors on the position of towns, by drawing a sketch map for each of two of the following: Aden, Bombay, Durban, Hong Kong, Mombasa, Wellington (N.Z.). Describe the commerce of the towns selected. (C.S.C.)

23. Illustrate the influence of geographical factors on the position of towns, by drawing a sketch map for each of two of the following: Buda-Pest, Cologne, Copenhagen, Istambul (Constantinople), Seville. Describe the commerce of the towns selected. (C.S.C.)

24. A textbook of geography refers to "the evolution of the strategic town of former times into the railway centre of to-day". Select one of the following towns: York, Carlisle, Shrewsbury, Stirling, and account for its development from a fortified town to a railway centre. (S.L.C.)

25. Carefully describe the position and discuss the reasons for the growth of four of the following towns: Middlesbrough, Limerick, Lincoln, Londonderry, Reading, Blackpool. (O.S.C.)

26. There are two main ports on the west coast of England (excluding Wales) and two on the east (excluding London). Explain the geographical causes that have contributed to the development of each, giving special attention to the resources of the hinterlands. (L.M.)

27. (a) Draw sketch maps to show three of the following channels of communication: Hudson-Mohawk gap, Rhône Corridor, Straits of Malacca, the waterway between the Black Sea and the Aegean Sea, Kicking Horse Pass, Lower Yangtse-kiang.

(b) Mark and name on each map one town which owes some of its importance to the use of the channel of communication.

(c) In each of the three cases name in spaces below the map (i) a region which sends its products through the channel, (ii) one of these products. (J.M.B.S.C.)

MAP QUESTIONS FOR REVISION

1. On a map of the world :

(a) Insert and name the Equator, the Arctic Circle, and the Prime Meridian of longitude.

(b) Name Iceland, Tasmania and Newfoundland.

(c) Mark and name San Francisco, Rio de Janeiro, Shanghai and Cape Town.

(d) Shade (i) a North American area producing cotton (by vertical lines), (ii) a South American area producing wool (by horizontal lines), (iii) an Australian area producing wheat (by diagonal lines).

(e) Insert a steamship route from London to Melbourne via the Suez Canal, naming two ports of call. (O.S.C.)

2. On a map of the world :

(a) Draw the isotherm of 32° F. for January over the North Atlantic and Europe.

(b) Shade all the land in the Southern Hemisphere which is over 4,000 feet (approximately) in height.

(c) Show by arrows the direction of the winds over the Indian Ocean in July.

(d) Show by dots, and by inserting the names, the position of the following ports : San Francisco, New Orleans, Colon, Port Said, Hamburg, Genoa, Karachi, Hong Kong, Batavia. (O.S.C.)

3. On a map of the world :

(a) Mark with a cross a place whose latitude and longitude are 20° S. and 135° E. respectively.

(b) Draw a line across the map to show where the sun can be seen overhead at noon on 21st December.

(c) Shade (by horizontal lines) three areas south of the Equator which receive most of their rain in the winter, and show (by arrows) the directions of the winds which bring the rain.

(d) Shade : (i) an area of temperate grassland in North America (by vertical lines) ; (ii) an area of tropical grassland in South America (by diagonal lines) ; (iii) the equatorial forests of Africa (by black dots).

(e) Insert a steamship route from London to Sydney (N.S.W.) via the Panama Canal and Wellington (N.Z.). (O.S.C.)

4. On a map of the world :

(a) Insert (without boundaries) the names of the following countries : Bolivia, Finland, Siam, Sierra Leone ; name Bermuda, Formosa, Hawaii Islands, Philippine Islands ; mark and name the capitals of Greece, Turkey, the United States, the Commonwealth of Australia.

(b) Shade four areas of very dense population outside Europe, and shade (in a different way) the hot deserts of the southern hemisphere.

(c) Indicate one area where large quantities of each of the following commodities are produced : wheat, rice, cotton, wood pulp, silk, wool, tin. Print the name of the commodity over the area.

(d) Draw the following routes : the shortest sea-route from Liverpool to San Francisco, the Trans-Siberian Railway from Moscow to Vladivostock, the main railway line from Cape Town to Katanga, a trans-continental railway across South America. (S.L.C.)

5. On a map of the Atlantic Ocean mark and name :

(a) Equator, Tropic of Cancer, Tropic of Capricorn, 40th N. parallel.

(b) The areas having rain mainly in winter.

(c) The wind systems of the North Atlantic.

(d) The water circulation in the South Atlantic.

(e) An equatorial forest, a coniferous forest.

(f) An area on the Atlantic where the skies are sunny. (L.M.)

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PRINTED IN GREAT BRITAIN
BY ROBERT MACLEHOSE AND CO. LTD.
THE UNIVERSITY PRESS, GLASGOW

